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THE
OPHTHALMIC REVIEW
A
MONTHLY RECORD
OF
OPHTHALMIC SCIENCE.

EDITED BY

J. B. LAWFORD,	}	LONDON.
N. M. MACLEHOSE, M.B.,		
KARL GROSSMANN, M.D.,		LIVERPOOL.
PRIESTLEY SMITH,		BIRMINGHAM.
JOHN B. STORY, M.B.,		DUBLIN.
EDWARD JACKSON, M.D.,		PHILADELPHIA.

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 ERRATA (VOL. X).

P. 185, lines 11 and 18, for *inch* read *mm.*

P. 333, line 11, and throughout the article, for *Mequert* read *Meynert*.

THE METRIC SYSTEM OF NUMBERING PRISMS.

BY SWAN M. BURNETT, M.D., PH.D.,

PROF. OF OPHTHALMOLOGY IN GEORGETOWN UNIV., DIRECTOR OF THE
EYE AND EAR CLINIC AT THE CENTRAL DISPENSARY, &c. &c.,
WASHINGTON, D.C.

Any innovation in an established method in science must justify itself by one or all of the following advantages :—It should be (1) more accurate; (2) more scientific; (3) more easily practised. The converse of this is equally true, that any method should be discarded in favour of a better one when it is either inaccurate, unscientific, or difficult to put in practice.

The system of numbering prisms at present in vogue, based upon the angular deviation of the sides, and ignoring the index of refraction of the glass, is obviously inaccurate, not to say unscientific, since it leaves one important factor in the result out of consideration altogether. That it should find defenders at all is astonishing, and when Prof. Hirschberg, in the discussion of the question at the late International Congress at Berlin, opposed the introduction of another method, more accurate and equally practicable, on the ground that the old plan was “good enough,”* it was

* His remarks, as he reports them himself, are as follows :—“Hirschberg erklärte sich gegen die Reform. Wir verordnen als Brillengläser Prismen von 2, 4, 6 Grad Brechungswinkel; die Ablenkung beträgt bezw. 1, 2, 3 Grad. Wir haben nur den Optikern zu empfehlen dass sie die Brechungswinkel des Prisma richtig mit dem Diamant einritzen.” (*Centralbl. f. prak. Augenheilk.*, Aug. 90.)

difficult to suppress the melancholy thought that scientific progress in Germany had struck the backward curve. There are, however, indications of unrest abroad in the profession which will not be layed by anything short of the best and most accurate to be obtained within the bounds of practicability; and even in the matter of prisms "approximations" cannot be long tolerated.

The only *raison d'être* of the present system was that an easy approximation to the deviating power of a prism was in that way obtainable, and it was never supposed that it would, or could, stand in the way of another method which offered the same ease in determination, with perfect accuracy. What we want to know in respect to a prism in ophthalmological practice is the work it does as expressed by the amount of deflection it causes in a ray of light which has passed through it. It is true that this work may be expressed by the angle which the deflected ray makes with the undeflected ray at the plane of incidence. The method of designating prisms by the minimum angle of deviation, as suggested by Dr. E. Jackson, of Philadelphia, is, beyond question, both accurate and scientific, but the difficulty of easily and readily determining what this angle is in any given prism must remain as an insuperable obstacle to its general adoption, and I am not aware that any plan has been as yet brought forward for overcoming it. The proposition to always use glass of a uniform index of refraction is not practicable, because the index of refraction varies often in the same piece of glass, and the index of each prism would have to be determined independently. This, besides being difficult to do, would greatly enhance the cost of manufacture.

Another method, which has been proposed by Dr. William S. Dennett of New York,* is based upon the

* *Trans. Amer. Oph. Soc.*, 1889.

"radian" as a unit. Few of my readers probably are aware what a radian is—and its definition will not be found in any treatise on optics proper. It does not belong to optical mathematics; it is of recent introduction, and pertains to a certain division of theoretical mechanics. As defined by Prof. Everett,* . . . "The name radian has been given to the angle whose arc is equal to the radius." This angle is equal to 57.295° . This, however, is too large an angle to be used as a unit; but Dr. Dennett proposes that we use the hundredth part of this for a standard which he calls the "centrad," and which is a little more than 0.57° .

It is difficult, at least to me, to conceive any advantage that the centrad can have over the minimum angle as proposed by Jackson. It is claimed that it is new—which is readily granted—and that it is not likely to be confounded with any other term in ophthalmology, which is also true; but neither novelty nor distinction are virtues which, by themselves, should count for gain in any proposed scientific method. There should be no objections to the employment of new terms in scientific nomenclature when they conduce to simplicity, clearness, and greater accuracy of definition, but nothing is to be more deprecated than the introduction of words or phrases which serve none of these purposes. Science is retarded rather than advanced thereby. The centrad can find no place in optics which is not filled by the angle, and could have no application in ophthalmology unless it would be to determine, for example, the velocity of the eye-ball or of the visual axis in traversing a given arc in a given instant of time.

It is, moreover, subject to the same objection as the angle, in the want of any ready means of determining it. So far as I have been able to inform myself, neither Dr. Dennett nor other advocate of the centrad has offered or devised any really practical method of

* "Units and Physical Constants." Macmillan & Co. 1886.

measuring prisms according to the radian system. With these facts in view—and another still more important one, that for its successful introduction and adoption, it would be necessary to educate the whole optical and ophthalmological world in terms and methods wholly alien to their customs and traditions—it would seem that the Fates are against it, in spite of the hasty approval given by the American Ophthalmological Society at its last meeting.

Now, what we want to know ophthalmologically in regard to a prism is, as we have already remarked, its power of deflection. That this can be measured by the angle is admitted, but this is not the only method, nor, in fact, in view of what we have shown, the best one. It can also be measured on a plane at right angles to the undeflected ray, and the one method is, scientifically, as legitimate as the other. There is no more reason for considering deflection of rays by angles, in a prism, than in a lens. The choice of one method over the other must rest on convenience or adaptability. In the study of all other refracting apparatus in optics, planes are used extensively. The great and enduring work of Gauss, on the elucidation and simplification of optical laws, has among its cardinal elements four planes—the anterior and posterior focal planes, and the two principal planes (*Haupt-ebenen*). The proportion of the size of image to object, as elucidated by the formulæ of Helmholtz, is also calculated on these planes; and the exhaustive work of Mr. Prentice on the resultant action of crossed cylinders* is a practical and successful application of the tangent deflection plane to the solution of one of the most difficult problems in ophthalmological optics.

Of course this plane can, in the case of prism deflection, be regarded, if so desired for any purpose,

* "Dioptric Formulæ for combined Cylindrical Lenses," etc. By C. F. Prentice. New York, 1888.

in the light of the tangent, or of the sine of the angle of deviation, but it is by no means necessary, and as a matter of fact the whole question can be reduced to the utmost simplicity by ignoring angle, tangent, and sine altogether, and taking a plane at some accepted standard distance, and measuring on this in a linear manner the amount of deflection. This plane can be regarded in the same light as the focal plane of the standard lens.

This method was first suggested and made practical by Mr. C. F. Prentice, of New York.*

Simply stated, the plan is the acceptance, as a unit or standard prism, of one which shall give a deflection of one centimetre on a plane at one metre distance. It is proposed to call this unit a prism-dioptre.—P.D.†

This is No. 1 of the series. No. 2 will give a deflection of 2 cm. at the metre plane; No. 3, 3 cm., and so on; 0·5 would give a deflection of 50 mm. at the metre plane; 0·25, 25 mm., and so on. In other words, there is expressed, as in the metre-lens or dioptre, the amount of work done, without considering the means by which it is done. The prisms may have any relation of angle to index, and it matters not so long as it gives the required amount of deflection at the standard distance of one metre.

Now, while it is exceedingly difficult, and only by the aid of complicated apparatus, to measure the minimum angle of deviation on the centrad, the amount of deflection on the metre plane is most easily determined; we have only to place a centimetre measure at a metre distance, and, looking through the edge of the prism, read off the amount of displacement of a vertical line, as seen above and below the edge, on the

* "A Metric System of Numbering and Measuring Prisms." By Charles F. Prentice. *Archives of Ophthalmology*, Vol. XIX., No. 1, 1890.

† Some objection has been made to the name, but, all things considered, it seems to be the most available and accurately descriptive, and it brings it into proper relation with the lens-dioptre, and is not new or strange.

scale in centimetres and decimals. The ratio of displacement being 1 to 100 (1 cm. to 1 m.), we can take any multiple of the metre as the distance of the plane, and make the calculation with the same ease. If, for example, we place the plane at a distance of $\frac{1}{4}$ m. 25 cm., the deflection of the unit prism would be 25 mm.; if at $\frac{1}{2}$ m. 50 cm., the deflection will be 50 mm.; if at 2 m., 2 cm.; if at 6 m., 6 cm.; and so on. Even in this rough manner it is possible to approximate to $\frac{1}{10}$ of the unit. The elegant and handy instrument which Mr. Prentice has devised, and which is described in the paper referred to, enables us to measure accurately the power of a prism to $\frac{1}{100}$ of a P.D.

Even if the system has no other merits than these, they would be sufficient to justify its adoption in preference to either of the two others proposed. But it has still other claims which we will consider in more or less detail.

It is certainly a merit that the new system introduces no new standard, but adopts the one at present in use to designate the focal distance of the standard metre-lens or dioptré—namely, the metre. This is too obvious to require comment.

It entails no revolution in the present methods of manufacture, and the stock of prisms now in the hands of the dealers can be utilized without inconvenience or trouble. This is an advantage which can hardly be over-estimated from a practical point of view. It so happens that the numbering of the prisms in degrees, as now employed, corresponds, in most cases approximately, to the numbers of the prism-dioptres. Mr. Prentice has gone very thoroughly into the mathematics of the subject in his paper, and it is only necessary here to call attention to it, to show how the stock now on hand can be used under the new nomenclature. The advantage of the new metric system, however, is that it is possible to get the desired prism even to the $\frac{1}{100}$ of a P.D., whereas in the old system it was

only an approximation, and in some instances the numbering of the prism differed from its real power by so much as half a degree. This variation, however, can be utilized very profitably in the new system, particularly when it comes to be applied to the metre-angle, where, as Mr Prentice has shown in his second paper,* decimals of a prism-dioptre must be taken into account.

This connection of the prism-dioptre with the metre-angle, which is so simple and direct, is another advantage which is not shared with either of the other proposed methods, though Dr. Jackson† claims it for the centrad. He fails, however, to show what the connection is, or the manner in which it is effected. To be able to know, by a simple measurement of the inter-pupillary distance, the value of the metre-angle, expressed in prism-dioptres, in any individual, instead of having to make all calculations for its value on an approximation, by taking an average inter-pupillary distance, is a circumstance which must not only enhance the value and practical application of the metre-angle, and make it fit in with refraction and convergence under the same unit of distance, but must make even the conservatives, contented with "well enough," wonder if a little trouble be not worth while, if it lead to absolute accuracy, and leaves out approximations entirely.

The prismatic action of decentred lenses is determined with exactness by this method, and much more easily than by any other. Mr. Prentice has shown in his second paper that the decentration of a lens to the extent of 1 cm. gives as many dioptres of prismatic action as the lens contains dioptres of lenticular refraction. For example, a lens of 2 D. decentred 1 cm. gives a prismatic action of 2 P.D.; if decentred

* *Archiv. of Oph.*, Vol. XIX., No. 22, 1890.

† *Ophthalmic Review*, June, 1890.

0.5 cm., the prismatic action is 1 P.D.; and so on. This ease and accuracy of determination opens up a wide field for the employment of decentred lenses in practice, which will, undoubtedly, be taken advantage of in future.

It is interesting to note how the tendency for some time has been, unconsciously, towards this metric system. In testing for insufficiencies of the external muscles, Schiötz* employs the separation of the double images at a certain distance, expressed in centimetres. These tangent deflections he converts into their corresponding angles. If the new system is used, there is no necessity for this tedious process, but the amount of insufficiency can be read off at once and expressed in values of prism-dioptres. If, for instance, the plane on which the double images are seen is at 4 metres, and there is a separation of 8 cm., the value of the insufficiency is expressed by 2 P.D. ($\frac{8}{4} = 2$); if the separation is 20 cm., its value is 5 P.D.; and so on. He says, in the same connection, "Just as we speak of amplitude of A, and express it in dioptres, so we can speak of amplitude of fusion and express it in degrees." . . . How much easier now to express it in prism-dioptres, and maintain, even in nomenclature, the closeness of relationship between accommodation and convergence. He says further: "If prisms could be ground to the metre-angle system, it would be of great practical value." This desideratum is now obtained, and in a way and manner which is more satisfactory and exact than if the metre-angle were itself taken as a standard, for we now have a reciprocal in P.D. of the metre-angle of every individual, and are not compelled to accept and use an average, and, moreover, can have this expressed, if desired, to $\frac{1}{100}$ of the unit.

* "A Contribution to the Theory of the Muscular Relations of the Eyes." By Dr. Schiötz. *Archives of Ophthalmology*, Vol. XIX., No. 283, 189c.

Mr. Maddox, in his work on prisms,* says :—" If I may be allowed to suggest it, a still better plan would be to have all prisms marked in metre-angles and their fractions, so as to correspond with lenses in the trial case, a metre-angle being the chosen unit of convergence, just as a dioptré is of accommodation. The only disadvantage is that the metre-angle is an inconstant quantity." From what we now know of the prism-dioptré we can see how nearly it comes to the fulfilment of the ideal of these two authors, both practical men, who have found the same need in their work, independently of each other.

It ought, perhaps, to be remarked, in regard to the centrad, that one of the chief claims to acceptance which has been urged on its behalf is not so pertinent to it as to the prism-dioptré. Dr. Dennett says in his paper : " The very general endorsement that modern writers on physics have given to the system of units and constants recommended by the London Philosophical Society, and now known the world over as the C.G.S. (centimetre, gramme, second) system, is certainly well deserved. Our method of numbering spherical and cylindrical glasses is in harmony with that system, and it is highly appropriate that the prismatic lenses which are so constantly used should be correspondingly named." The sentiment here expressed is the same essentially as that of Schiötz and Maddox, and which is felt by all who have thought of the question at all. The difficulty, however, is that the author has not carried out his idea in proposing the centrad as a unit. The radian has no connection with linear measure, or trigonometry, or anything else that has an application in optics, if we except its reciprocal angle of 57.295° . As already pointed out, it has only to do with certain problems involving time and velocity, and comes under the head of the "second" in the unit system, rather

* "Ophthalmological Prisms." By E. E. Maddox. 1889.

than the "centimetre." Its application to the prism is therefore not a natural, but a forced one.

The prism-dioptre, however, does have a proper and legitimate place in the C.G.S. system, because it accepts, as a unit of strength, its centimetre deflection at the metre plane.

It is somewhat curious, however, that the actual working power of the centrad is, up to a certain point, approximately that of the prism-dioptre, for if a radius of one metre be taken, the hundredth part of the radian at that distance will be just one centimetre, and for a circle so large it may be considered as equivalent to the tangent. The difference between the arc (the centrad), the tangent (the prism-dioptre), and the sine (the metre-angle), is, even for a prism so strong as 10° deviation, not very great.

The arc of 10°	...	=	0.17451
The tang. „	...	=	0.17633
The sine „	...	=	0.17365

For a prism of 5° , which is as strong as is commonly used in ophthalmic practice, the difference is apparent only at the fourth place of decimals.

The advocates of the centrad should therefore rejoice that it is possible to come so nearly to their ideal in so simple, direct, scientific, and practical a manner as can be done by the prism-dioptre.

But there is still another point of view from which the question should be considered. The manufacturing optician who is to furnish the prisms is one whose opinion is not to be ignored. To make prisms cheaply, they must be manufactured in large numbers at once, and the process is such that it is never possible to predict with certainty what the power of any particular prism will be. On these practical points the following extract from a letter from Messrs. Bauch & Lomb, one of the largest manufacturing firms of optical goods in America, is not only interesting on this point, but valuable and instructive :—

"We will say that some standard should be recognized by the medical profession, and, from all we have read of the prism-dioptre, we are inclined to believe that it is the most practical for several reasons. First of all, our calculations being based upon the metric scale, it affords a uniformity with other optical lenses; and in the second place, no additional expense in grinding prisms to this system is incurred, from the fact that every single prism, though it may deviate from a fractional part of a metre, will find and represent a market value.

"It would have been a somewhat difficult problem for the dealer in optical instruments to determine these deviations in prisms ground to the metric system; but with the introduction of the prismometer, no one can fail to detect even the slightest deviation in the angle of the prism. For a manufacturer who is compelled to reduce the cost of his goods to a minimum on account of natural competition, this system is the better of the two, for the reason that each and every perfect prism ground can be sold, and selections made from stock of any angle and minutest deviation as the demand requires.

"Now, as we understand the system advocated by the two gentlemen above referred to (Drs. Dennett and Jackson), each and every prism must be accurately ground to produce fixed deviations exactly, and no other; while this can be done, the percentage of such prisms from a whole grinding would be so infinitesimally small, that the manufacturer would be obliged to advance the selling price to such an extent, in order to cover himself from any losses, that the demand cannot help but be very small. If prisms could be blocked on grinding shells direct to a steel or iron surface without any intervening substance, it might be a simpler method, but the mode of blocking glass, which, as far as we know, is now employed by all manufacturers of lenses, is by cementing the glass by means of a substance to a steel or iron shell, and even though this substance is allowed to harden before the process of grinding goes on, it becomes more or less pliable during the process of grinding and polishing; and no matter how thin the strata of substance may be, there is more or less yielding, and the result that the angle is not true.

"If the opticians had a voice in this question, there is no doubt in our mind that they would prefer prisms ground to the metric scale. They have accustomed themselves to the metric system as they are using spherical and cylindrical lenses ground to this system, and by means of the prismometer can determine in an instant the deviations existing in the prisms furnished them by the manufacturers."

Note.—Since writing the foregoing, I have read, in the last number of the *Archives of Ophthalmology* (Vol. xix., No. 4), an article by Dr. E. Landolt on the "numbering of prismatic glasses used in ophthalmology." The points raised by Landolt are, I believe, fully answered in the body of this paper; but it is perhaps due to him, as one of the members of a committee (to which I also

have the honour to belong) appointed at the Washington International Medical Congress to take this matter into consideration, that some notice be taken specifically of one or two objections to the metric system which he deems important.

He says: "The tangent—called prism-dioptre—also requires explanation, and can only be comprehended by its reduction to degrees with which we are acquainted." Anyone who has read what we have written in regard to this will see at once that this is neither a fair nor a perfectly correct statement, if I have in any way succeeded in making the essence of the system clear. The deflection at the metre plane *can* be regarded in the light of a tangent to the angle of deviation if anyone so chooses, but, as we have shown, it is not at all necessary nor, in fact, is it desirable.

He says further: "Now, we appreciate and express the excursions of the eyes as well as their anomalies in angular degrees: the field of fixation, the angle of strabismus are objectively measured by instruments which . . . are divided into degrees."

It is true that strabismus and the field of fixation are now measured by degrees, but they can be equally well expressed by linear measurements at a metre plane, or a multiple thereof, and in a manner corresponding with, and reciprocal to, the prism-dioptre. Dr. Landolt has himself devised and published such a plan* of measurement of deviation in strabismus, &c. It is true he regards these in the light of tangents, but it would be just as easy—in fact, more simple and as scientific—to regard them as prism-dioptre deviations. In speaking of the metre-angle, concerning which he has written more than any other person except the author himself, he says: "It is better, if need be, to convert metre-angles into degrees, than to reduce angles which have an absolute value to metre-angles, these being variable

* "A Manual of Examination of the Eyes," 1879; and other places.

in different individuals." The precise meaning of this sentence is not very clear, but whatever interpretation is put upon it, it has been shown that it is better, from the stand-point of accuracy, to have an expression of the metre-angle which is precise to the $\frac{1}{100}$ of the unit for each and every individual, than to use the approximation—and not always a very close one at that—based on an average inter-pupillary distance for all persons.

JENSEN (Copenhagen). On the Diseases of the Eye accompanied by a Central Scotoma.*—*Nordisk Ophthal. Tidsskrift*, Vol. III. 1.

Notwithstanding the numerous and even exhaustive investigations that have been made of the diseases of the eye which are accompanied by a central scotoma, our knowledge of these affections is still imperfect. The reason for this is, partly, that different authors have conducted their examinations in different manners and from different starting-points; and partly, also, that the scotomatous affections run a particularly chronic course, while the treatment plays a subordinate part. Great patience is therefore required, both on the part of the observer and the patient,

* I had intended to make a full abstract of an important work by Jensen bearing the above title—"Om de med centralt Skotom forløbende Øjensygdomme"—which was published about a year ago. In the meantime, an abstract by the author himself appeared in Danish in the "*Nordisk Ophthalmologisk Tidsskrift*" (vol. iii. 1). I have thought it better merely to translate that abstract, as it is written in a language which is not much read. The original work contains a very complete *résumé* of the most important facts connected with the functional condition, history, and course of all the cases of central scotoma met with in Professor Hansen Grut's clinic at Copenhagen during a number of years, as well as an exhaustive critical discussion of the literature of the subject. A number of drawings are given, which show the differences met with in the scotoma and field of vision in the different diseases which are more or less characterised by the presence of a central scotoma, and which are classed under the different headings referred to in the abstract.—GEO. A. BERRY.

in order to collect material capable of affording trustworthy information as to the definitive result.

If we examine the literature of the subject, we find that the chief interest has always attached itself to that group of cases which is described under the name of amblyopia centralis, or toxic amblyopia. This group has been by some looked upon as a pure amblyopia, and has been accorded a place as a well-defined disease, definitely distinguishable from the other cases in which neuritic or atrophic changes are met with in the papilla. By others the group has been relegated to the category of optic nerve diseases, owing to the occasional partial atrophy of the papillæ to be found on ophthalmoscopic examination, as well as to its functional analogy with optic nerve disease in general. The latter have consequently taken all, or as good as all, scotomatous affections as expressions of different stages of the same anatomical process.

The first view, as is well known, has been maintained in this country (Denmark) by Krenckel. The latter view—the principal representative of which is Leber—has, however, more recently come to the front, since by a series of anatomical investigations it has been shown that a central scotoma may be occasioned by a partial affection of the corresponding nerve-fibre bundle in the optic nerve.

These post-mortem discoveries have of course not afforded any proofs of the correctness of Leber's views, as, even if they had established that the symptom (central scotoma) is in all cases occasioned by an affection of the macular fibres at a definite point in their course, which is by no means the case, we should not on that account be justified in assuming the identity of all the diseases which exhibit this symptom. For this, a correspondence in other respects is also required, and in this respect it is only from clinical observations that elucidation is to be looked for.

At Prof. Hansen Grut's clinic, scotomatous affections have all along been regarded with interest. As already stated, Krenckel in 1876, from observations made at that clinic, claimed for amblyopia centralis the dignity of an independent disease. He gave, too, the following definition of that condition:—"Amblyopia centralis is a defect of vision occurring in men of middle or advanced life, and simulta-

neously in both eyes. It is characterised by an absence of corresponding pathological changes in the eye, and by the defect being confined to the central portion of the field of vision, where it occurs as a negative scotoma of peculiar shape and extent, which is most readily demonstrable for colours. The disease runs a chronic course, but is not seldom recovered from, and never leads to blindness."

Krenckel therefore excluded from this group all those cases in which there is found ophthalmoscopically neuritis or atrophy of the optic nerves (with the exception of the partial atrophy of the papillæ, the existence of which he considered somewhat doubtful). All the cases of that description which he had observed differed in their clinical aspect from the typical amblyopia centralis. As these cases, however, were few in number, and differed in many respects, besides, one from another, it was impossible to relegate them to definite types of disease, and Krenckel was therefore obliged to admit that the amblyopia centralis group was least definitely circumscribed in that direction.

In the years that have elapsed since Krenckel's monograph was written there have been, besides a large number of cases of typical amblyopia centralis, not a few atypical cases met with at the clinic. A number of the latter, too, have been under observation for a good many years. From the notes taken of these cases, I have in a recent publication endeavoured to render our knowledge of the symptomatology and prognosis of atypical central scotomata more complete, as well as to indicate the differential diagnosis between them and typical central amblyopia.

In the following pages I shall shortly refer to the conclusions to which I have come in that treatise.

Of 60,125 patients treated at the clinic of Prof. Hansen Grut, from the 1st Oct., 1875, to 31st July, 1889, 269 were cases of negative central scotoma.

This number includes all cases, without reference to whether the ophthalmoscopic examination was negative or positive, to whether the periphery of the field of vision was normal or not, and to whether the affection had arisen suddenly or gradually, and in one or both eyes. On the other hand, amblyopiæ without restriction of the field of

vision have not been included where no absolute or relative defect of the central vision has presented itself in the form of a scotoma.

These 269 cases, supplemented by a few previously published by Krenckel, may be arranged in the following groups ; viz., cases of—

1st, Amblyopia centralis.

2nd, Stationary scotomatous optic atrophy.

3rd, Progressive scotomatous optic atrophy.

4th, Bilateral optic neuritis with central scotoma.

5th, Unilateral amblyopia, neuritis, or atrophy, with central scotoma.

6th, Glaucoma simplex.

The last of these groups hardly belongs to the subject under discussion, and will therefore not be referred to more closely.

Group 1.—Amblyopia centralis includes the majority of the cases—viz., 189. In three of these cases the scotoma was unilateral at the time of the examination (the only examination made) ; in all the others it was bilateral.

Amongst these patients there was only one woman, whose symptoms were, however, typical.

Only 35 patients were under 40 years of age, 8 of these under 30; the remaining 154 were over 40—25 of these being over 60.

With regard to the etiology, symptoms and course, these corresponded on the whole with the description given by Krenckel. The following points, however, call for accentuation :—The scotoma was in no case absolute for a white object of the usual size ($\frac{1}{4}$ cm. to 1 cm. square) at the usual perimeter distance. On the other hand, it was found in some cases examined according to Bjerrum's method, with small objects, at a great distance,* that these objects disappeared from view within a small area, between the fixation point and the blind spot, and nearer to the former : an area corresponding, therefore, to that within the scotoma, where the vision is found by the colour test to be most defective. The vision in the patients

* Usually an object 3 mms. in diameter at 2 metres distance, corresponding to a visual angle of circa 5'

who were examined by this method varied from $\frac{5}{18}$ to $\frac{5}{50}$; in a single patient, with a smaller degree of amblyopia, in whom the affection had nearly passed off, but where the scotoma could still be demonstrated by coloured objects, no defect could be made out with a minimal visual angle test (not even circa 2').

The situation of the small defects for "minimal" visual angles was not in all cases the same, but was always symmetrical.

A pathological pallor of the temporal portion of the papillæ was noted in but a few cases (17): it is possible, however, as so much depends on individual judgment, that another observer would have arrived at a different number. A complete atrophy of the papillæ never occurred during the length of time over which the observations extended. Neither was there ever observed a complete blindness; the acuteness of vision in only a very few cases was reduced further than to counting fingers at 4 or 5 metres, while a recovery or improvement was the rule.

Group 2.—*Stationary scotomatous optic atrophy* is represented by twenty cases, and must therefore be said to be a rare disease. From the cases observed I have given the following description of the disease:—

It occurs exclusively in young men under the age of 34, usually between the twentieth and twenty-fifth year; occasionally showing a hereditary tendency, sometimes apparently caused by want of sleep and other weakening factors; often without any demonstrable cause. The affection begins with considerable amblyopia, which occurs either suddenly or reaches a maximum in the course of a short time, without being accompanied by disturbances of general health; it develops usually simultaneously in both eyes.

On examination of the field of vision a central scotoma is found of about the same size and form as in amblyopia centralis, but much more complete—white objects, presenting a visual angle of 1 to 2 degrees, disappearing either entirely or becoming very indistinct within its area.—Corresponding to this, fixation is uncertain or eccentric. During its course the density of the scotoma, and consequently the central amblyopia, remains as a rule unchanged.

The periphery of the field of vision may present slight anomalies in the colour sense; rarely complete or permanent red-green blindness. Further, transitory defects of peripheral vision for white objects may arise. As a rule, the periphery remains normal during the whole course.

Ophthalmoscopically there is found to be complete atrophy of the papillæ, and this sometimes very early; as a rule, it is decided before the lapse of a year. Occasionally there may be a suspicion of a neuritic origin; on the other hand, a decided intraocular neuritis is never found to precede the atrophy. The prognosis of this affection is bad *quoad restitutionem*, but absolutely good *quoad cæcitatem*.

Group 3.—Progressive scotomatous atrophy (23 cases) is in many respects a complete contrast to the foregoing group. Just as in the cases of the foregoing group, it is only met with in men—but in middle-aged men—between the fortieth and fiftieth year; as good as never before the thirty-fifth.

With regard to anamnesis, there is frequently a history of syphilitic infection acquired several years before. Of accompanying conditions there are to be found the usual premonitory symptoms of tabes dorsalis, pupillary immobility, myosis, absence of tendon reflex, &c.

The defect in vision comes on gradually; generally first in the one eye and then in the other, rarely simultaneously in both.

The affection begins as a central amblyopia, with a central colour scotoma and intact periphery.

The scotoma has exactly the same form and degree of saturation as that in amblyopia centralis, and, just as is the case in that affection, the defect for white objects can only be discovered for minimal visual angles. During the course of the disease the scotoma retains its size and its relative character.

In the periphery, on the other hand, anomalies come on characteristic of progressive atrophy: the boundaries for colours become narrowed centripetally; and finally, though often very late, those for white also. At this stage the original scotoma is frequently unrecognisable; the disease runs a course similar to an ordinary progressive atrophy

and the prognosis is as bad as other cases of that description.

Complete atrophy of the papillæ comes on with certainty, and as a rule earlier than in the preceding form: it may generally be diagnosed at an early stage.

This group represents therefore—not as do the other forms—an independent type of disease, but it must be looked upon as a particular form of development of tabetic atrophy.

The differential diagnosis between amblyopia centralis and stationary scotomatous atrophy is based in the beginning upon etiological points, more especially age, as well as on the development of the visual defect and the character of the scotoma. At a later stage it is based upon the ophthalmoscopic picture and the course. The differential diagnosis between stationary and progressive scotomatous atrophy, besides being based upon points in the etiology, is especially influenced by the age at which the disease begins. The thirty-fifth year seems to form the boundary line between these groups. Further, the diagnosis is influenced by the manner in which the disease develops, by the nature of the scotoma, and lastly, by the course, therefore in the main upon the same points as above. The differential diagnosis, finally, between amblyopia centralis and progressive scotomatous atrophy is based at the beginning upon the anamnesis, and the nature of the development of the disease; later, in addition to these, on the ophthalmoscopic appearance and the functional condition. In a few, though very rare cases, a beginning progressive atrophy may resemble completely a typical amblyopia centralis with regard to the functional defect; and on this point it is important to remember that the malignant affection may be recognised by the existing premonitory symptoms of *tabes dorsalis*.

To Krenckel's definition of amblyopia centralis there should therefore be added that we are not justified in diagnosing that affection before having satisfied ourselves that spinal symptoms do not exist. This is more especially applicable to those cases in which the affection is unequally developed in the two eyes, in which the temporal portion of the papilla shows a suspicion of atrophy, in which the central visual acuity is only slightly reduced, and where no

abusus can be demonstrated. Of course, one must also be on one's guard against "pseudo-tabetic" symptoms, which may accompany, especially alcoholism and diabetes mellitus. The reflex pupillary immobility—which is such a constant symptom in true tabes, but very rare in pseudo-tabes—is therefore the most important differential sign.

The *fourth group*—bilateral scotomatous optic neuritis—includes 11 cases, which are very different, both with respect to age and sex, as well as to symptoms and course. The greatest interest in these cases is, that they show that a central scotoma can occur with optic neuritis, the cause of which is an intra-cranial affection, particularly meningitis, and which affection must be taken to be present in them all.

The scotoma here is sometimes only just indicated, sometimes relative and typical in its character as in amblyopia centralis, sometimes absolute as in the second group. The intensity may vary during the course of the affection. The periphery of the field of vision shows different conditions, sometimes considerable constrictions, sometimes no abnormality. The course taken is that of neuritis in general: sometimes there is recovery or improvement with disappearance of the neuritic phenomena, and an atrophic condition of the papillæ; in other cases a persistence of considerable amblyopia. No case led to blindness. The scotoma does not therefore in any way characterise these affections, and its presence must be looked upon as the expression of a particular localisation of the morbid process in the optic nerve. Their differential diagnosis from the three preceding groups will be easy in the cases in which there is a decided intraocular neuritis or evident cerebral symptoms (intense headache, vomiting, etc.), or both. If, on the other hand, these affections are met with at a stage in which none of these symptoms are definitely pronounced, which is readily possible, difficulties might arise as to diagnosis. With respect to amblyopia centralis, it should be remembered that it does not cause absolute central defects or restriction of the field of vision; neither do progressive atrophies cause absolute defects, and, besides, as a rule the amblyopia will be slight in the pre-atrophic stage. The greatest difficulty in the diagnosis might be in distinguishing them from cases of

stationary scotomatous atrophy, as these may show slight neuritic appearances, the difficulty might then sometimes only be cleared up by prolonged observation.

The *fifth group* includes 22 cases in which the scotoma was found in the one eye, whilst the other has been quite normal. Here very different conditions were found. In some cases the affection was a unilateral neuritis caused by local encephalo-meningitis, orbital affections, or the like; in others, an affection of the optic nerve in connection with menstrual disorders; in others, the affection was undoubtedly hysterical; in others, again, it had to be looked upon as depending upon an incomplete embolism of the central artery of the retina; finally, two cases pointed to a beginning of glaucoma simplex.

The result of my investigations is therefore, shortly, that there exist two well-defined and different forms of disease in which the scotoma forms the special feature—viz., amblyopia centralis and stationary scotomatous atrophy. In addition, this symptom is presented now and then by affections of quite a different nature: first and foremost, and not so very seldom, by an optic atrophy of a tabetic origin; next, by symptomatic neuritides; and, finally, also by affections which have nothing at all to do either with inflammatory or primarily degenerative changes in the optic nerve (embolism, glaucoma).

The demonstration of a central scotoma does not therefore immediately show the exact place of the affection within the system. In order to fix this place there is required in addition a knowledge of the condition of the other functions of the eye, of the development of the disease, of the state of the papillæ, of the patient's age when the disease began, and of the anamnesis.

The view which has most adherents at the present day, and according to which the scotomatous affections constitute an entity, must therefore be considered incorrect according to the experience of this country. Moreover, it is easy to show that the clinical facts on which this view is based do not by any means bear it out. Thus it has been asserted from the clinical side that slight cases of toxic amblyopia, which is synonymous with amblyopia centralis, as we understand the

term, may pass on to severe cases, to those cases in which the scotoma is different in form and intensity, and in which neuritic change or complete atrophy of the papillæ is seen ophthalmoscopically. There is not, however, to be found in the literature of the subject a single well-authenticated example of such a transition. The assertion is therefore based partly on the existence of the scotoma in both forms, which, as we have seen above, does not prove anything; partly on the circumstance that both forms of the disease may have a toxic origin.

But, apart from the circumstance that the demonstration of a poisoning influence in any given case is not a proof that the poison is the cause of the affection, a suspicion must at once be aroused by the fact that, of the two poisons which are supposed to be capable of causing amblyopia centralis—namely, nicotine and alcohol—the latter alone is blamed for producing these severe affections of the optic nerve. Since chronic alcoholism, in contradistinction to nicotine poisoning, frequently causes meningitis, one would naturally infer that that form of poison acts only indirectly, and that the severe cases of alcoholic amblyopia are to be relegated to my fourth group.

This supposition gains in probability if we consider the second fact upon which the theory of the uniform nature of the scotomatous affections is based—viz., the asserted analogy between amblyopia centralis (*qua* toxic amblyopia) and the other forms of amblyopia from intoxication, poisoning by bisulphide of carbon, lead, iodoform, etc., as these latter do not resemble the typical amblyopia centralis, but the atypical severe cases, and they are characterised as symptomatic neuritides, partly by the abnormality in the forms as well as the inconstancy of the scotomata, partly by the frequently existing intraocular neuritis and the usually accompanying cerebral symptoms.

It has further been asserted that typical amblyopia centralis may proceed to progressive atrophy. To judge from the few recorded cases of this nature, they have not been cases of amblyopia centralis, but of the initial stage of tabetic atrophy.

As already stated, a partial affection of the optic nerve

has latterly been shown by a series of anatomical investigations to be the cause of a central scotoma observed during life; and with the idea in view that the scotomatous affections are uniform in their nature, an attempt has been made to ascribe to this discovery validity in all cases. We have seen, however, above, how different in their clinical aspects are the forms of disease in which the scotoma makes its appearance; we have seen that the cases belonging to the separate groups from the first reveal their several peculiarities, that they occur each under special conditions, and have each a different course and prognosis. From this it follows of necessity that the process lying at the bottom of these must be in each case different in its nature.

Another question is, whether for the production of a central scotoma there must always be a morbid process in the papilla-macular bundles of the optic nerve. The answer to this demands anatomical examination of cases taken from all the different groups. Material of this nature has not as yet been forthcoming.

The cases which have been examined anatomically belonged clinically, as far as may be gathered from the reports given, partly to the fourth group (considerable amblyopia, absolute scotomata, cerebral complications, etc.), and in these there was found a partial interstitial neuritis of the optic nerve and meningitis; partly to the third group (slight amblyopia, relative scotomata, partial atrophy of the papillæ, in one of the cases *tabes dorsalis*), and here there was found a primary atrophic degeneration of the same bundles of fibres.

We are in possession, therefore, up to this time only of sections of these forms in which the scotoma is a chance or transitory phenomenon, and the question as to the pathological anatomy of these affections as a whole is not hereby answered, inasmuch as possibly—certainly, as far as the latter cases are concerned—other conditions would have been found had the optic nerves been examined at a later stage in the course of the disease. So far there have been no sections in amblyopia centralis, and in the stationary scotomatous optic atrophy—in the most definite forms of disease, therefore, in which the scotoma is the feature of the affection.

So far as amblyopia centralis goes, there are different circumstances which point to the cerebrum as the site of the affection. The possibility of a partial affection of the optic nerve is not excluded, but it must be looked upon as of quite a peculiar nature—always isolated, confined to the papillo-macular bundles without the slightest tendency to spread, but with great tendency to recovery; symmetrical, too, in the two eyes.

The last point—the simultaneous occurrence and similar development in both eyes—is especially suggestive of a common cause in a higher centre. With respect to stationary atrophy, it is difficult to imagine an isolated affection of the papillo-macular bundles; at all events, if such exist, the ophthalmoscopic picture points to a more diffuse affection, but implicating, however, these bundles in a preponderating manner. Here, too, the idea of a common central course must also present some degree of probability.

GEORGE A. BERRY.

BRUCE (Edinburgh). On the Segmentation of the Nucleus of the Third Cranial Nerve.—*Proceedings Royal Society, Edin*, 1889—90.

In this paper Dr. Alex. Bruce gives an explanation of a number of drawings from sections made through the nucleus of the third nerve. The sections were mainly from the foetal brain stained by Weigert's method. The ones represented were selected from a series of transverse vertical sections.

The groups of cells recognised by Dr. Bruce, and forming the anatomical segmentation of the nucleus, are the following:—(1) An anterior group; (2) a postero-external group; (3) a median group; (4) a postero-internal nucleus; and (5) a superior nucleus.

The *anterior group* extends almost the whole length of the nucleus, lying throughout close to the posterior longitudinal bundle of fibres. It is itself markedly segmented. The chief divisions are an inferior nucleus

characterised by the absence of commissural fibres between the two sides, and a main nucleus. The anterior nucleus is largest at its lowest end, and fades gradually away to its upper end, where it lies at a slightly lower level than the superior or small-celled nucleus of Darkschewitsch (*vid. inf.*).

The *postero-lateral group* lies near the outer end of the longitudinal bundle. Dr. Bruce has given to a group of cells lying to the outer side of the middle and upper part of the postero-lateral group the name, external nucleus. These cells lie partly between and partly outside the longitudinal bundle.

The *median nucleus* lies in the middle line surrounded by the anterior group of cells. Its upper portion "is bounded laterally by fine medullated fibres, which arise from its nerve cells and pass along its outer surface forwards, to enter, partly, the root of the nerves, and partly the posterior longitudinal fasciculus."

These three groups have all apparently much the same kind of motor cells. Those of the other two groups are different.

The *postero-internal*, or pale nucleus, has more oval or round cells with large nuclei and fewer processes. They are stained a much fainter brown by Weigert's method than those of the other groups. The pallor is caused by the paucity of medullated fibres between the cells, and also by the presence of large surrounding lymph spaces. This nucleus occupies a space between the median and postero-external nuclei, but reaches to a higher level than the median nucleus. It ends above in a club-shaped head. This part is probably what has been described by Westphal as the medial nucleus.

The superior nucleus, the small-celled nucleus of Darkschewitsch, is a small indefinitely circumscribed group at the upper extremity of the region occupied by the cells connected with the oculo-motor nerve and at the outer margin of the posterior longitudinal bundle. Many of the fibres of this bundle appear to end in the cells of the superior nucleus.

With reference to the connection of the roots of the third nerve with the different nuclei Dr. Bruce concludes

with the following remarks:—"While it is certainly premature to express any positive opinion as to the functions of the various nuclei described, there would appear to be ground (see Westphal's case, *Arch. f. Psych.* XVIII.) for the belief that the inferior, anterior, and postero-lateral (including external) groups of nuclei are connected with the extrinsic muscles of the eyeball and the elevator of the eyelids, and that the median and the postero-internal nuclei are the centres for accommodation and contraction of the pupil. If the view of Kahler and Pick be correct, then the postero-lateral group will form the centres for the elevators, while the anterior nucleus will be connected with the internal rectus, and the inferior nucleus with inferior rectus. With regard to the two central groups, the median and postero-internal, the evidence seems to be insufficient for the view which would place the accommodation centre at a higher level than that for the contraction of the pupil. The circumstance that a nuclear lesion seems invariably to affect the accommodation of both eyes, while a similar lesion may undoubtedly affect the sphincter iridis of one side alone, seems best explained by the view that the accommodation act is controlled from one centre, while there are two centres for the contraction of the pupil. If this view be correct, then the median nucleus may form the centre for accommodation and the postero-internal nucleus that for pupil contraction. In this respect the intimate relation of position of the median nucleus to the main portion of the anterior nucleus (the supposed centres for the associated acts of accommodation and convergence) is of interest." With reference to the last sentence it must be said that the clinical evidence in favour of any preformed centre for the association of convergence and accommodation is far from conclusive.

GEO. A. BERRY.

E. GALLEMAERTS (Brussels). A Contribution to the Study of Synchrony Scintillans. Graduation Thesis, Brussels, 1890.—*Reviewed in Revue Gen. d'Ophthalmol.*, October, 1890.

This thesis, upon a subject which has as yet undergone but little investigation, contains a careful account of the histological examination of three eyeballs, all of which during life exhibited the ophthalmoscopic appearances known as Synchrony Scintillans.

The author analyses and discusses the previous writings upon this affection, and, as the result of his own researches, concludes that the crystals visible in the vitreous during life are undoubtedly composed of cholesterin. Poncet had reported previously that he found tyrosin in the vitreous in similar cases, but Gallemaerts failed to discover this product in any of his three specimens. Poncet had also described small white brilliant globules which he found in addition to the tyrosin, and which he thought were phosphatic. Gallemaerts believes that these globules are collections of pigmented cells derived from the pigmented epithelium lying between the ciliary processes; these cells, collected into groups, form small and large spherical bodies, which represent, according to the writer, the multinucleated spheres described by Poncet, and considered by him to result from phosphatic incrustation of a cluster of cells, the cluster being the product of the division of a single cell. Gallemaerts concludes from his investigations that synchrony scintillans is due solely to cholesterin; that no phosphatic compounds are present. He then proceeds to inquire as to the conditions which lead to the formation of cholesterin in the eyeball, and from which of the tissues it is derived. The healthy vitreous and aqueous humours are entirely devoid of cholesterin, and some pathological process must occur to lead to the precipitation of this substance in these media. The frequency with which synchrony follows accidental or operative traumatism (24 out of 50 cases) suggested to the writer that the crystals are the result of degenerative changes in extravasated blood, but microscopic examination led him to decide against this view. He also excludes the lens from any share in the production of the crystals, having

generally found it but slightly affected in these cases, and having on no single occasion discovered the characteristic crystals in its substance. Histological examination of the vitreous proved to the writer that hyalitis could not be regarded as the cause of synchysis scintillans, and by a process of exclusion he became convinced that the affection of the vitreous depends upon a choroiditis. He found in his specimens extensive changes, including some inflammatory exudation in the uveal tract. The question then arose, why should this condition lead to the formation of cholesterin crystals? The author thinks some diathetic influence must be admitted, and he believes that synchysis scintillans is more common among the alcoholic, the arthritic, and those with any serious disorder of nutrition. The local cause is to be found in the uveal tract.

As to treatment, little can be said. Succinate of iron has been commended, especially in America, but without very strong evidence of its value. Synchysis scintillans is a contra-indication to operative measures upon the eye, but this the writer holds is mainly on account of the general condition to which its presence testifies.

J. B. L.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, DECEMBER 11TH, 1890.

HENRY POWER, F.R.C.S., President, in the chair.

On Some Points in the Development of Cataract.—Mr. W. A. Brailey read this paper, in which he stated that, excluding the congenital and zonular cataract, and also those secondary to local or general diseases—such as glaucoma, iritis, or diabetes—seven per cent. of the total cases seen in private practice were found to have some degree of opacity of the lens; but in only one, on the average, out of these seven was the cataract sufficiently advanced to justify operation. From the records of all his patients with immature cataract that had been re-examined within the last two years, it was found that 45 per cent. of them remained absolutely unchanged for the worse; the interval between examination and re-examination varying between three months and eight years.

Four other cases were slightly better as regards vision, thus making 58 per cent. in which the sight had not deteriorated. Twenty-three per cent. had become decidedly worse, inclusive of four cases (13 per cent.) in which the cataract was sufficiently advanced to justify removal under ordinary circumstances. The slight improvement of vision in 13 per cent. of the cases was attributed to the hygienic measures adopted with regard to the use of the eyes. It was observed that the cataracts which had remained stationary were mainly of the cortical variety; whereas those getting slowly and steadily worse were chiefly nuclear. Other differences existed between the two groups: the cortical variety was attended in about two-thirds of the cases, both at its onset and for long afterwards, by irritative symptoms, such as conjunctivitis, photophobia, lacrimation, slight redness of the optic discs, and by aching in the eyes and head, especially on use of the eyes. There was often also increase in the refraction, and augmentation of the power of accommodation, with occasionally slight spasm of accommodation. Finally, it was suggested that while the senile nuclear cataract was a degenerative change, the cortical variety often exhibited the characters of an inflammation.

The President said the views put forward by the author of the paper were much in accordance with general experience. He recalled an axiom of Sir William Bowman's, never to operate whilst a patient could see to read with either eye. The rate of development of cataract varied much in different individuals, and probably depended in part on constitutional causes; but in some cases the progress appeared to be delayed by hygienic precautions, such as rest for the eyes and attention to the general health. He was unaware of the condition having ever actually disappeared spontaneously.

Mr. Silcock said he thought that the group of symptoms associated with one class of cases to which Mr. Brailey had drawn attention might prove of value in prognosis.

Dr. W. J. Collins mentioned the case of a woman in whom cataract had been diagnosed by Sir William Bowman twenty-five years previously, and a sketch made. The cataract was still immature. He thought the myopia which

developed in cataractous eyes was due to the increased density of the lens ; he had found an increased percentage of solids in cataractous lenses.

Mr. Waren Tay was interested in Mr. Brailey's account of the symptoms, other than failing vision, which were present in cases with immature cataracts.

Mr. McHardy said that evidence was wanting that much use of the eyes hastened the maturation of cataract, and that he advised patients to make free use of what vision remained. He thought that the altered state of refraction was due to change in the refractive index of the media, and varied to some extent with the general health.

Paresis of the External Recti.—Mr. Doyne (Oxford) exhibited, and read notes of a case he had brought before the Society last session with the above title. He now thought the condition was more correctly described as spasm of convergence. The patient, a lad aged 17, now had vision of $\frac{3}{16}$ with each eye separately, and J.8 at three inches. His eyes were usually in a normal position, but as soon as examination was begun, spasmodic convergence showed itself. The refraction was always apparently myopic, though of varying degree ; under atropine, however, a low degree of hypermetropia became manifest. Extreme restlessness and sighing, and profuse perspiration when under observation, were noticeable symptoms. Mr. Doyne thought the case was one which might be classed as neurotic, but suspected also that there was deliberate malingering.

Paralysis of External Recti Muscles after Diphtheria.—Mr. A. Stanford Morton read notes of four cases of paralysis of the external recti due to the poison of diphtheria. Three of these patients had come under his observation during the last ten months, and the fourth was a patient of Mr. Tay in 1876. All complained of somewhat similar symptoms, such as "crossing" of the eyes and "seeing double," together with more or less defective sight, weakness of the limbs and staggering gait. The paralysis of the externi came on from four to seven weeks after the sore throat. Its shortest duration was four weeks, and in one case it has been present twenty-six weeks. In addition to the paralysis of the externi there was in one case defective action of the superior and internal recti. The pupils acted well to light and con-

vergence in all the cases. The accommodation was affected in three of the cases; being absolutely paralysed in one. Loss of the patellar reflex was very marked. The shortest period in which this symptom was recovered from was three months. In two of the cases the reflex was still absent after a period of twenty-six and sixteen weeks respectively. These cases were reported because of their apparent infrequency.

Dr. Sidney Taylor (Norwich) referred to a case of paralysis of external recti following epidemic influenza.

Supposed Sanguineous Lacrimation.—Mr. Richardson Cross reported this case, occurring in a lady aged 21. She was seen in June, 1889, on account of slight follicular conjunctivitis of the left eye, and some discomfort referred to the inner part of the upper lid. On July 2nd she returned, saying that considerable inflammation had followed the use of a lotion prescribed, and that on two or three occasions blood, or a blood-stained tear, had suddenly suffused the eye and fallen down the cheek. A cold douche for the eye and an iron tonic were prescribed, and some days later the patient again presented herself directly after a drop of blood had fallen. There was a small red fibre in the canaliculus and a similar thread under the lower lid. No ulcer or hæmorrhagic spot could be discovered, but the eyeball looked redder than before, and the plica semilunaris was swollen and congested. After the lapse of a year the patient returned, complaining that one or more drops of blood-stained tears, or blood, suddenly suffused the eye and fell down on her book or her work, at all sorts of times, every two or three days, and even two or three times a day. The tear had been observed to come as if from under the inner part of the top lid, to run mainly along the plica and caruncle under the lower lid, and to leave a blood stain on whatever it fell. Blowing the nose showed that a mere tinge had passed through the lacrimal canal. Stooping seemed to encourage the blood flow. The bleeding continued in spite of treatment by large doses of iron, which improved the general health. In October the patient came again, immediately after some blood-stained tears had fallen; there was still a small red fibre or clot between the plica semilunaris and the caruncle, and another under the lower lid. The

conjunctiva, especially at the plica, was congested. At the end of the month the patient was walking with her mother when she stooped down to tie her shoe-lace, and at once the eye bled. Within a few minutes she was seen by Mr. Cross. The eye looked blood-stained, and a red film was in the conjunctival sac, as before. Several spots of blood were on her handkerchief, which were tested with guaiacum and hydrogen peroxide, and gave a definite blood reaction. The eye-sac was carefully examined; no spot could be detected from which the bleeding seemed to have occurred; the caruncle was slightly swollen, the plica distinctly so, and its vessels congested. Mr. Cross said there could be no doubt of the accuracy of the facts as stated by the patient. The symptom was a most exceptional one, and the literature in connection with it very scanty. Hasner and De Wecker had alluded to it, the latter in connection with scorbutus. There had been no tendency to other hæmorrhage, no indication of hysteria, and the patient was very anxious to get rid of the malady. She had been at times distinctly anæmic.

Living and Card Specimens.—Messrs. Critchett & Juler: Microscopic sections of Epithelioma of Cornea and Conjunctiva.—Mr. Treacher Collins: Rupture of the Posterior Lens Capsule following a blow on the Eye.—Mr. Beaumont: Macular Coloboma.—Mr. Lawford: Case of Sub-hyaloid Hæmorrhage.

[We have received a communication from Dr. Alexander, of Aix-la-Chapelle, asking us to correct an error contained in an article in the REVIEW for April, 1890, on "Paralysis of Ocular Muscles in Congenital Syphilis." In this paper (p. 102) it is stated that in Alexander's work, "Syphilis und Auge," no mention is made of ocular palsy in hereditary syphilis. This statement is incorrect. On p. 200 the condition is referred to, and two cases are quoted—one reported by Von Græfe, the other by Mackenzie.—ED.]

A HISTORICAL ESSAY ON THE DEVELOPMENT OF OUR PRESENT KNOWLEDGE OF GLAUCOMA.

BY H. SNELLEN, M.D.,

PROFESSOR OF OPHTHALMOLOGY IN THE UNIVERSITY OF UTRECHT.

Ophthalmology has developed so rapidly in our time that we have had the good fortune to witness a complete period in its history. To the historian this is unquestionably an advantage, though it involves him in some risk of prolixity. During the successive phases of a rapidly unfolding science, many ideas are conceived which later must be laid aside as incorrect; but it is difficult for one who has witnessed and taken part in the advance of the subject to pass over these older ideas without notice: he remembers how important they formerly appeared to him, and he knows by experience what good service they did in pointing the way towards a truer knowledge.

I willingly accepted the invitation, with which your committee* honoured me, to recall to your memories something of the historical development of our knowledge of glaucoma, but I saw at once that whole volumes must be laid before you if I would deal completely with the subject. I therefore determined to speak only of the more salient facts in the history of glaucoma, and must offer this as my excuse if I leave unmentioned some points which are not without importance.

* The Dutch original of this paper was read at a general meeting of the Medical Society of Holland, in Utrecht, on July the 8th, 1890.

We have seen the gradual transformation of glaucoma from an obscure and mysterious condition into a well-defined and well-understood morbid process, the treatment of which may now be reckoned among the most successful of our efforts, while, within times which many of us well remember, it still belonged to the class of absolutely incurable diseases.

The older authors of the last century, and even Hippocrates,* knew this disease, but knew it only by its final stage: namely, as a greenish-yellow discoloration of the pupil, with dilatation of the same, and with shallow anterior chamber, which led to blindness, and to cataract of peculiar appearance.

In Boerhaave's *De Morbis Oculorum* we find glaucoma mentioned only under the heading *De Cataracta*, and as a form of cataract which begins with pain, and which ends with loss of all light perception:—

“Dolores magni profundi diuque tolerati in fundo oculi et pertinaces, aliquando cataractam faciunt; tandem enim evanescit splendor oculi, oritur color opacus, et fit cataracta.†

“Si humor ibi collectus colore desinit in flavum, viridem, nigrum, etc., erit cataracta spuria. Tales vero cataractas nemo veterum attingere voluit.”‡

Boerhaave remarks thereby that whilst the eye is blinded by secondary cataract the pupil becomes immovable:—

“Hinc oritur duplex casus quando in nonnullis cum visu mobilis iris persistit, in aliis immobilis fit cum cæcitate.”§

Of the peculiar pathognomonic symptom of glaucoma, the hardness of the globe, he says nothing.

In the work of Fabini,|| a century later, we read of the stony hardness of the eye.

The great English oculist, W. Mackenzie,¶ in his

* *Aphorismi*, sect. iii. 31.

† Herm. Boerhaave, *Prælectiones Publicæ de Morbis Oculorum*. Editio altera. Parisiis, 1748, p. 107. ‡ L. c., p. 139. § L. c., p. 112.

|| Fabini, *Doctrina de Morbis Oculorum*, 1831.

¶ W. Mackenzie, *A Practical Treatise on the Diseases of the Eye*, 1830.

celebrated hand-book (1830), was the first to properly value the increased tension of the eye; in this book, moreover, we find many views which did not until much later receive the attention they deserved. Mackenzie gives completely the differential diagnosis between senile and glaucomatous cataract:—

“The eyeball always feels firmer than natural; while in cataract it presents its usual degree of resistance to the pressure of the finger.” *

In the fourth edition of his hand-book (1854) he describes acute glaucoma as choroiditis with severe inflammatory symptoms, and suggests a means of cure:—

“Paracentesis of the cornea, or of the sclerotica, affords great relief of pain.” †

This paracentesis, either of cornea or sclera, which Mackenzie advised and employed, was practised by Desmarres in Paris during the years 1848 to 1858, and with the same result—temporary, but rarely permanent improvement. The prognosis in glaucoma remained as unfavourable as it was in the year 1842, when Sichel ‡ wrote:—

“Il n'existe point d'exemple avéré de guérison du glaucome.

“Les observations de guérison du glaucome ou d'amélioration du glaucome par des opérations doivent avoir pour base des erreurs de diagnostic ou la confusion dans la terminologie.”

On the same subject Desmarres said:— §

“Le glaucome amène toujours tôt ou tard la perte complète et incurable de la vue dans l'œil qu'il attaque, et le plus souvent il frappe les deux yeux, à des distances plus ou moins éloignées. Je ne pense pas qu'on puisse obtenir une amélioration soutenue dans cette maladie dont ordinairement le traitement le mieux dirigé ne peut entraver le progrès.”

The triumph of overthrowing this terrible prognosis was reserved for Albrecht von Graefe; but for the attainment of this result a better knowledge of the

* L. c., p. 57-.

† L. c., 4th ed. p. 570.

‡ Sichel, “Propositions sur le Glaucome,” *Annales d'Oculistique*, 1842.

§ L. A. Desmarres, *Traité Théorique et Pratique des Yeux*, deuxième édit., vol. iii., 1848, p. 737.

morbid changes which precede the final stage was indispensable, and the way thereto was opened by H. von Helmholtz by his great discovery of the ophthalmoscope in the year 1851.

The results of ophthalmoscopic examination did not at first correspond with the expectations entertained. Lens and vitreous were found to be far more transparent in the early stage of glaucoma than had been supposed, and nothing was to be seen of the extensive choroidal changes which, according to theoretical preconceptions, underlay the disorder, and of which Arlt * had obtained anatomical evidence in one case of secondary glaucoma.

In the year 1853 Jacobson † published his dissertation on the ophthalmoscopic examination of glaucoma, and arrived at purely negative results.

Edward Jaeger ‡ described and figured a peculiar change of the papilla in glaucoma, which we now know to be an excavation, but which was regarded at that time as a globular swelling. Von Graefe § himself at first shared in this error, and may have been led thereto by his theory as to the inflammatory nature of glaucoma. He expected exudation and vascular dilatation in the optic nerve, and accordingly mistook the excavation for a globular protrusion.

Adolph Weber || explained how different depths in the eye can be discriminated, firstly by the parallax movements which occur when the observer alters the direction in which he views the fundus; and secondly, by the difference between the lenses which are required in order to obtain equally sharp images of objects lying at different depths in the eye by the direct method.

Heinrich Müller ¶ gave the first anatomical de-

* Arlt, "Zur pathologischen Anatomie des Auges," *Prager Vierteljahrsschrift*, 1847, s. 53.

† Julius Jacobson, "De Glaucomate," *Diss. Inaug.*, Königsberg, 1853.

‡ Ed. Jaeger, *Ueber Staar und Staaroperationen*, Wien, 1854.

§ *Archiv f. O. i. I.* s. 373.

|| *Archiv f. O. ii. I.* s. 141.

¶ *Archiv f. O. iv. I.* s. 377.

monstration of the excavation of the papilla in glaucoma.

Albrecht von Graefe* about the same time discovered the venous and the arterial pulse on the papilla, the latter being perceptible only when the eye is extremely hard.

Donders† showed that the arterial pulse can be induced in healthy eyes also, by a gradually increasing pressure on the globe, and that at the moment when the pulse appears, vision is temporarily abolished.

Coccius‡ found in this phenomenon an index of the tension of the eye—the harder the eye, the more easily is the arterial pulse induced by the pressure of the finger.

The leading symptom of glaucoma, the increased tension, was now diligently studied. Bowman§ sought to ascertain how many different degrees of tension can be distinguished by the feeling of the finger-tips, and found that, starting from normal tension, three degrees in each direction could be determined with sufficient certainty; namely, -1 , -2 , -3 , and $+1$, $+2$, $+3$. Since that time many efforts have been made to measure the tension objectively, and with automatic registration. Theoretically, the way of doing this has been determined, but in practice Bowman's method is still preferred, and rightly so, for tonometers are complicated instruments, which easily get out of order. Moreover, the instrumental method has the disadvantage of being unpleasant to the patient, and causing contraction of the lids, with consequent momentary increase of tension. This latter difficulty can, however, be avoided by the use of cocain.

* *Archiv f. O.* i. 1, s. 373. Ibid. i. 2, s. 299.

† *Archiv f. O.* i. 2, s. 75.

‡ E. A. Coccius, *Ophthalmometrie und Spannungsmessung*, Leipzig, 1872.

§ *British Medical Journal*, Oct. 11, 1862.

Meanwhile, von Graefe pursued his researches on the consequences of glaucomatous pressure. When the pressure rises rapidly we have the so-called acute glaucoma, with its well-known symptoms: supra-orbital pain, sickness, and general depression; dilatation of the pupil, shallowing of the anterior chamber, clouding of the transparent media, loss of sensibility in the cornea, and rapid impairment of vision, with contraction of the visual field, and sometimes a complete loss of light-perception for the time being. As a rule, the severity of the attack soon passes off, but only to recur after a time, and to lead, after a larger or smaller number of such recurrences, to the final stage of the process, yellowish-green discoloration of the pupil and incurable blindness. The attacks may still return even then, and lead to necrosis and perforation of the cornea, with choroidal hæmorrhage and violent pain. In such cases enucleation of the eye is the only means of giving relief. In other instances the course of the disease is less violent. The loss of vision is accompanied by dilatation of the sclera, especially in the region of the equator. When this sclerectasia passes into the more anterior part of the sclerotic, the glaucomatous process usually comes to a standstill.

The evil results of acute glaucoma are seen more rarely now than formerly, thanks to our better knowledge of the early symptoms, and to the means which we possess of arresting them. This better knowledge we owe in the first place to the work of Albrecht von Graefe.

The changes which may precede an attack of glaucoma, and pass off leaving no mischief behind, were described by von Graefe as the premonitory symptoms: a slight rise of pressure, the beginning of excavation and arterial pulsation in the papilla; supra-orbital pain, interrupted vision, and the appearance of rainbow colours around a flame. The latter are interference-phenomena caused by cloudiness of the corneal

epithelium, and can be imitated by viewing a flame through a glass sprinkled with lycopodium.*

Permanent changes gradually follow: the hardness of the eye, the dilatation of the pupil, and the excavation increase; the visual field contracts. The form and manner of this contraction were accurately studied by Haffmans† under the guidance of Donders.

And now the treatment. All the changes indicated that glaucoma consisted essentially in an over-fulness of the eye. On this ground, von Graefe resolved to make a trial of paracentesis. He evidently had at that time no knowledge of the earlier trials of Mackenzie and Desmarres. His results agreed entirely with theirs: he obtained a temporary relief of the symptoms; as a rule, however, they soon recurred. Among a large number of cases he noted a permanent improvement in only two.

During his trials of the action of iridectomy on the eye, von Graefe had observed that in staphylomatous eyes, which are usually hard, iridectomy was able to permanently lower the tension, and thereby to lead to a diminution of the staphyloma. This observation led him to try iridectomy in glaucoma also:—

“In Juni 1856 wandte ich das Verfahren zuerst, und von dann ab, besonders auf die oben als *acutes Glaucom* geschilderten Fälle an. Die unmittelbare Effecte stellten sich sofort als sehr günstig heraus.” ‡

His further trials of iridectomy showed that the result is best assured when the iridectomy is broad, and that benefit is most to be expected in cases in which the eye is hard at the time of the operation.

To von Graefe we are greatly indebted for our more accurate knowledge of the phenomena of glaucoma. His discovery that the deleterious course of the disease

* These phenomena were at first wrongly attributed to cloudiness of the lens. See F. C. Donders, “Kleurenzien,” *Ned. Lancet*, ii. 6, 1851, p. 609.

† J. H. A. Haffmans, *Bijdrage tot de Kennis van het Glaucoma*, Utrecht, 1860.

‡ *Archiv f. O.*, iii. 2, s. 493.

can be arrested by iridectomy is of priceless value. How, then, is the action of this operation to be explained, and wherein lies the essential cause of glaucoma? These two questions hang closely together.

Von Graefe sought the nature and essence of glaucoma in an inflammatory process originating in morbid changes in the blood-vessels; he therefore regarded the acute attack as the typical form.*

Donders, on the other hand, regarded the acute symptoms as secondary—as results of a condition of increased tension induced by vaso-motor influences. To this assumption he was especially led by the experiments of Claude Bernard on the influence of nerve-irritation on secretion in the salivary glands, which at that time were exciting much attention.

Although von Graefe, during fifteen years, performed iridectomy upon thousands of glaucoma-patients with the most beneficial results, he strove in vain to find the key to the mystery of the cure. Shortly before his death, in his last work, he reviewed his efforts up to that time, and declared himself highly satisfied with the benefits which his operation had conferred, but still quite unable to explain its mode of action:—

“Im Allgemeinen lastet über der Aetiologie des Glaucoms noch das alte Dunkel, trotz der Forschungen so vieler Beobachter, die ihre Aufmerksamkeit dem Gegenstand in der Neuzeit zugewandt haben” †. . . Hinsichtlich der Theorie der Glaucomoperation, so ist sie, trotz mancher Bemühungen, nicht erheblich gefördert worden.” ‡

This lack of explanation was expressed still more strongly by Schweigger, the pupil and successor of von Graefe:—

“Die Wirkung der Iridectomie bei Glaucom ist eben lediglich ein Erfahrungssatz; über die Art und Weise der Wirkung wissen wir, was bei einem chirurgischen Eingriff gewiss sehr merkwürdig ist, eben so wenig wie über die Ursachen des Glaucoms. Natürlich aber besitzen wir für beides eine ansehnliche Menge von Theorien und Hypothesen.”

* *Archiv f. O.*, xv. 3, s. 108.

† *L. c.*, s. 229.

‡ *L. c.*, s. 252.

"Wir wollen darüber hinweg gehen; wer sich gewöhnt hat mit der harten aber gesunden Kost der einfachen Thatsachen zufrieden zu sein, trägt kein Verlangen danach auf dünnen Haide der Speculation sich im Kreise herum zu bewegen." *

New observations and new facts were necessary before a new theory could be built. During the twenty years which have passed since von Graefe's death, many stones have been prepared for the building. In the first place, certain physiological questions required an answer: the nutrition-processes and the circulation of fluid in the healthy eye—how do they take place?

A series of physiological researches, at the head of which stands the classical work of Leber,† have established that the highly vascular ciliary body is the chief secreting organ of the eye. The freshly-secreted fluid stands in close osmotic relation with that which is contained within the thin membranes of the vitreous body. A slight excretion of fluid occurs at the back of the eye from the vitreous body into the lymph-spaces of Schwalbe in the optic nerve. The chief stream passes over the lens and through the pupil into the anterior chamber, traverses the latter to reach the angle formed by the junction of the iris and the cornea, passes through the meshes of the ligamentum-pectinatum, and by diffusion and filtration is taken up into the plexus of veins known as Schlemm's canal. There is no direct connection between the anterior chamber and the lymph-spaces which, according to Schwalbe, exist in Schlemm's canal.

The influence of the nervous system on the pressure of the fluid is indirect.

The pressure of the fluid regulates the outflow, so that when the afflux is increased, a compensatory in-

* A. Th. C. Schweigger, *Ueber Glaucoma*, 1877. Volkmann's *Klin. Vorträge*, s. 1042.

† *Archiv f. O.*, xix. 2, s. 87, 1873. Also Graefe-Saemisch, *Handbuch der ges. Augenheilkunde*, ii. 2, s. 302.

crease of the efflux occurs. Thus Adolph Weber* found, after ligature of the vortex veins in a rabbit, a well-marked but transient engorgement of the intra-ocular vessels, and an increase of tension. The excess of tension is relieved by an increase of the collateral circulation, and of the escape of the intra-ocular fluid.

In the light of these facts most of the older glaucoma-theories already mentioned fall to the ground.

No less important were the new facts contributed by pathological anatomy. The most important point revealed by the examination of glaucomatous eyes is the adhesion of the iris-base to the periphery of the cornea. The priority of this discovery is usually ascribed to Heinrich Müller, who wrote, in the year 1858—

“Die Iris adhärirt mit ihrem Ciliarrand fest am Hornhautrand, während sie vom Ciliarkörper sehr leicht abreißt.” † . . . “Die Iris haftete mit ihrer Peripherie fester an der Sklera als am Ciliarkörper, wie es bei dergleichen Fällen häufig der Fall ist.” ‡

In view of the great importance which this observation now has in relation to our knowledge of glaucoma, it is worth while to mention here—I find no mention of it in the literature of the subject—that Donders, three years earlier, in a series of pathological observations in the *Netherlands Lancet*, noted the following:—

“Verkleining der voorste oogkamer, door vergroeiing der peripherie van de geheele voorvlakte der iris met de achtervlakte der membrana Descemetii, eenvoudig door aanlegging, ten gevolge van verhoogde drukking, bjj exsudatie-processen in de achterste deelen van het oog.” § [“Diminution of the anterior chamber through adhesion of the periphery of the anterior surface of the iris with the posterior surface of Descemet’s membrane, simply as a consequence of increased pressure through exudation processes in the hind part of the eye.”]

But neither Donders nor Heinrich Müller understood the pathological meaning of this discovery, for physiology had not then found out that the normal escape of

* Adolf Weber, “Die Ursache des Glaucoms,” *Archiv f. O.*, xxiii. 1, s. 81. † *Archiv f. O.*, iv. 2, s. 22. ‡ *Archiv f. O.*, iv. 1, s. 366.

§ Derde serie, vijfde Jaargang 1855, blad. 44.

the superfluous intra-ocular fluid occurs by filtration at this very angle. It was not until twenty-five years after this first observation that Knies* and Adolph Weber,† almost simultaneously, published the very important fact that the adhesion at the angle of the chamber is a constant condition in typical glaucoma with shallow anterior chamber. Knies observed this condition in fifteen eyes examined by him. Adolph Weber demonstrated the importance of a closure of the filtration angle by injecting oil into the anterior chamber in animals; glaucomatous tension at once supervened.

On this discovery Knies based the theory that glaucoma originates in an adhesive inflammation of the iris-periphery—that the inflammation in the neighbourhood of Schlemm's canal is to be regarded as the primary change, and not merely as the consequence of increased pressure in the vitreous body.‡ But although the anatomical discovery was certainly most important, Knies' explanation did not suffice to clear up the nature of glaucoma; it only put the difficulty a step further back. Whence comes the typical adhesive inflammation? And another difficulty arises here: If the stream of fluid meets with its first obstruction in the angle of the anterior chamber, why does not the chamber deepen? There is, in fact, an atypical form of glaucoma in which fibrinous exudation is deposited on the walls of the anterior chamber, and a simultaneous increase of tension and deepening of the chamber occur.

Adolph Weber's view appears more plausible. According to him, the adhesion is a secondary change, induced by the pressure of the abnormally swollen ciliary body. Whence comes, then, this abnormal swelling?

It often happens that a therapeutic remedy furthers our knowledge of a morbid process. The employment of an active remedy is a physiological experiment, the

* *Archiv f. O.*, xxii, 3, s. 163.

† *Archiv f. O.*, xxiii, 1, s. 1.

‡ *L. c.*, s. 197.

effect of which must be taken into account in analysing the nature of a disease. Thus, the fact that the tension of the eye is lessened by iridectomy must be brought into accord with the explanation of glaucoma. And there is another remedy, the discovery of which has proved highly important both from the therapeutic and etiologic point of view.

Von Graefe* himself had noticed that in most cases of glaucoma atropine does harm; not only because the very wide dilatation of the pupil renders the performance of an iridectomy impossible, but because the mydriatic induces an increase of the pressure with all its evil consequences.

Laqueur,† of Strassburg, asked himself the question to what extent an action antagonistic to that of the mydriatic could be obtained by the use of a myotic? The result entirely answered the expectation: the myotic, as it contracts the pupil, lowers the tension, if this be abnormally high. Since that time myotics have become most useful in the treatment of glaucoma. By their use one can, without harm—indeed, with advantage—postpone the operation to a convenient time; they facilitate the operation. Further, the effect of the operation is sustained by the myotic action.‡

At the outset many voices were raised against the use of myotics in glaucoma, on the ground that the improvement thus obtained might lead to a dangerous postponement of the operation, and is in many cases quite transient; and also that in some cases a sudden increase of tension, with all its evil consequences, accompanies and is, indeed, caused by the myosis. Further experience has, in fact, shown that the myotic is a two-edged sword: by the contraction of the pupil the meshes of Fontana's space are

* *Archiv f. O.*, xiv. 2, s. 117.

† *Archiv f. O.* xxiii., 3, s. 149. *Centralbl. der Med. Wiss.* 1876, No. 24.

‡ H. Snellen, *Myotica en Sclerotomie*. Donders, *Feestbundel* 1888, p. 405.

widened, and the absorption of the fluid is promoted ; but, on the other hand, the energetic and repeated use of the myotic causes a spasm of accommodation which, as we shall shortly see, is to be feared under certain circumstances. We see, then, that the use of weak myotics is of great value in the treatment of glaucoma, but is not usually sufficient of itself to cure the disease, and that a too energetic use may be dangerous.*

These effects of mydriatics and myotics on glaucomatous tension can be satisfactorily explained in connection with the absorption of fluid at the angle of the anterior chamber. The thickening of the iris during mydriasis promotes the closure of the filtration angle ; contraction of the pupil draws the iris away from it. This view of the fact shows in the clearest manner that the explanation of glaucoma is to be found, not in an increase of secretion, but in a disturbance of excretion.

Priestley Smith, one of the first authorities in relation to our knowledge of glaucoma, upholds the opinion of Adolph Weber, that the adhesion of the iris-base arises under certain circumstances through abnormal pressure on the part of the ciliary processes :—

“The ciliary processes push forward the iris-base, and are often themselves pushed forwards by an advance of the lens and zonula.” †

According to Priestley Smith, a large lens is a predisposing factor in the production of glaucoma. He points out that the lens, like all structures developed from the cuticular epiblast, continues to grow throughout the whole of life by cell-proliferation, and that by reason of its peculiar construction it increases in size even up to the extreme of life. He established this fact by a large number of measurements,‡ and holds

* For this reason we use by preference the weaker myotic pilocarpine instead of the more energetic eserine, which latter has the further disadvantage of easily becoming clouded by fungus.

† Bericht über den VIIIten intern. Ophth. Congress, Heidelberg, 1888, s. 236.

‡ Trans. of Ophth. Soc. of United Kingdom, vol. iii., p. 79.

that it explains the increased liability to glaucoma which comes with the advance of life, and the almost complete immunity of the young.*

By a further series of measurements he ascertained that the average diameter of the cornea is smaller in glaucomatous eyes than in healthy eyes, and holds that eyes with a small cornea are especially predisposed.†

According to his statistics in relation to sex,‡ men and women are equally liable to chronic glaucoma, while women show a greater tendency to suffer from inflammatory attacks.

Under the predisposing circumstances described, all causes of congestion in the eyes may become causes of glaucomatous attacks:—

“Congestion of the uveal tract involves enlargement of the ciliary processes, and this, if it be extreme, or if the space at the disposal of the processes be insufficient, leads to compression of the filtration-angle.” §

The question has often been raised, to what extent strain of the accommodation tends to induce glaucoma. So long ago as 1854, Mackenzie|| mentioned “overuse of the eyes on near objects” as one of the causes of glaucomatous choroiditis. Twenty-five years later, G. E. Walker repeated the assertion, alleging that overstrain of the accommodation may give rise to inflammation in the eye, without, however, explaining the nature of such a process:—

“The long-continued overaction of the ciliary muscle begets in it an irritable state, which only wants some provocation to develop an active inflammation.”¶

W. Schoen, of Leipzig, has the merit of being the first to show by statistics that the occurrence of glaucoma is often associated with neglect of the use of proper

* Trans. of Ophth. Soc. of United Kingdom, vol. vi., p. 307.

† Ibid., vol. x.

‡ Ibid., vol. vi. p. 311.

§ *Brit. Med. Journ.*, 1889, vol. i., p. 933.

|| L. c., 4th edition, p. 571.

¶ G. E. Walker, *Essays on Ophthalmology*, London, 1879, p. 63.

glasses. His explanation of the ill-effect of this appears to me, however, as unsatisfactory and improbable as that of Walker. He supposes that after a strain of the accommodation the ciliary muscle becomes suddenly relaxed, and that as a result of this the lens is pressed forwards.*

At the Seventh International Congress at Heidelberg, in 1888, I explained how, in my opinion, the influence of accommodation may take effect. In the young eye, during accommodation for a near point, the diameter of the lens is reduced to about the same extent as that of the contracting ciliary circle. The circumlental space remains about as wide as it was before, and the zonula remains tense as before. But the conditions are quite different in advanced life, when the elasticity of the lens is lost; the ciliary circle contracts, but the form and size of the lens remain unchanged. The ciliary processes are thereby pressed against the lens and the zonula is slackened. This idea finds confirmation in the pathological observations of Priestley Smith:—

“In such cases the ciliary processes are in close contact anteriorly with the iris, *internally with the margin of the lens*; or, if no longer in contact, their wedge-like shape shows that in the living eye they have been tightly pressed between these structures.” †

If the foregoing is correct, a timely and careful correction of refractive and accommodative errors must manifestly tend to restrain the glaucoma.

The beneficial effect of iridectomy was attributed at first to the excision of a piece of the iris. Others held that the main element was the peculiar wound in the margin of the sclera. Stellweg was the first to substitute sclerotomy for iridectomy. In many cases a permanent effect was obtained thereby, especially when a myotic

* “Die Accommodations-Ueberanstrengung und deren Folgen,” *Archiv O.*, xxxviii. 1, s. 195.

† *Brit. Med. Journ.*, 1889, vol. i., p. 879.

was employed before and after the operation. Should it be proved, as I think it will, that the essential part of the operation is the scleral wound, it will still be necessary in many cases to combine an iridectomy with it, because when the pressure is high the iris very easily prolapses, and is apt to check the free escape of fluid from the chamber.

Accurate measurements of the corneal curvature before and after sclerotomy or iridectomy have shown that a certain flattening of the cornea results from the operation, especially when the eye is hard. This flattening cannot occur except as the result of an ectasia at the margin of the sclera, and at the same time the ciliary body must be removed from its previous contact with the lens by this yielding of the sclera. In my opinion, the effect of our glaucoma-operations depends on restoring the peri-lenticular space through this anterior ectasia of the outer coat of the eye.

SOME EXPERIMENTS TO DETERMINE THE LESION IN QUININE BLINDNESS.

A PRELIMINARY NOTE.*

By G. E. de SCHWEINITZ, M.D.,

OPHTHALMIC SURGEON TO THE PHILADELPHIA AND CHILDREN'S
HOSPITALS ; OPHTHALMOLOGIST TO THE INFIRMARY
FOR NERVOUS DISEASES.

The characteristic clinical features of the cases of quinine amaurosis, summarised by Knapp† as total blindness subsequent to taking large quantities of quinine—pallor of the optic disc, marked diminution of the retinal blood-vessels in number and calibre, and contraction of the visual fields—have been elaborated, especially by American ophthalmic surgeons from the time when Roosa's report appeared up to the date of the elaborate analysis by Atkinson.‡ These features are so definite that blindness from the abuse of quinine is an established fact, and it only remains to be shown what exactly is the lesion, and what its position, which causes the loss of vision. Buller§ believes the seat of the morbid process is to be found in one of three situations—(1) within the cranial cavity ; (2) within the eye ; and (3) in the course of the optic nerve, between the chiasma and the eye-ball. He rejects the first two of these positions, and is inclined to think the latter affords the best explanation, by assuming a rapid effusion into the lymph spaces around the nerves, too transient to cause papillitis, but sufficient to induce œdema

* Read before the College of Physicians of Philadelphia, Nov. 5, 1890.

† Archives of Ophthalmology, vol. x. p. 220.

‡ Jour. Amer. Med. Association, Sept. 28, 1889.

§ Trans. Amer. Oph. Soc., 1881.

and blanching of the retinae and impediment in the blood-carrying capacity of the central arteries. Edgar A. Browne * points out the resemblance of the subjective symptoms to embolism of the central artery of the retina, but shows that such a theory is untenable. He further indicates the probable local nature of the retinal anæmia, the influence of the vaso-motor system, the absence of peri-neuritis,† and suggests the possible influence of highly-cinchonized blood upon a peripheral circulation, causing sufficient contraction to prevent the ingress of blood. It is obvious, as Buller has said, that uncomplicated cases of quinine blindness are rarely encountered in human beings, because this drug is not administered to them in sufficient dose to produce amaurosis, unless some disease calling for its exhibition is present. Thus in Browne's collection of thirteen cases the following diseases were present:—Intermittent fever, pernicious fever, septicæmia, pneumonia, neuralgia, malaria, and drunkenness. Exceptions to this are instances where the alkaloid has been taken by mistake, one of which is given by Browne, and the case of a man described by Giacomani, who took three drachms of quinine instead of cream of tartar, to relieve constipation. This example, as Dr. Gruening has pointed out, presents the value of a physiological experiment. As the opportunity for the study of such cases has been rarely presented, the best method is to induce quinine blindness in animals, observe the early ophthalmoscopic appearances, and microscopically to study the optic nerves, chiasma, and cortical centres of vision. With this end in view the following experiments were undertaken. In all of them dogs were used whose general condition was healthy, and whose fundus oculi was

* Trans. Ophth. Soc. U.K., vol. vii., p. 193.

† Dickinson's case of tumefaction of the optic nerve, resembling "choked disc," was probably caused by some factor—possibly malaria—other than quinine.

shown by ophthalmoscopic examination to be normal. The quinine was administered hypodermically in solutions made with muriate of quinine combined with carbamide of urea, or the bisulphate dissolved with the aid of tartaric acid.

Experiment No. 1.—March 13th, 4 p.m. Dog A; weight 16 pounds. Sixty grains of quinine injected beneath the skin. An hour later the dog vomited several times, and dragged its hind legs. Twelve hours later, the dog blind.

March 14th, 4 p.m. Dog entirely blind; pupils widely dilated and irresponsive to light. The discs pallid, and retinal vessels contracted.

March 15th, 12 a.m. The same state of affairs.

March 16th. Blindness continues. There is slight clouding or mellowing of edges of discs.

March 19th. Dog entirely blind. Optic nerve whitish, edges clear, vessels much contracted.

March 29th. Sufficient recovery of sight only to keep him from walking into large objects; perhaps familiarity with room explains this. Optic nerves pale, vessels small.

April 11th. No further recovery of sight. Killed, and eyes, chiasma, optic tracts, and occipital lobes of brain removed and placed in Mueller's fluid.

Experiment No. 2.—March 17th, 4 p.m. Dog B; weight 15 pounds. Hypodermic injection of one drachm of quinine. Previous examination showed normal pupils and fundus oculi.

March 18th. No general symptoms except great weakness when put into kennel between 6 and 7 p.m., apparently "not seeing anything well." (Statement of attendant.)

March 18th. Dog found dead at 6 a.m. Eyes, optic chiasma, and occipital lobes removed and put in Mueller's fluid.

Experiment No. 3.—March 19th, 4 p.m. Dog C; weight 10 pounds. Thirty grains of quinine given hypodermically. In ten minutes the hind legs were dragged, the dog was partially paraplegic and staggered in his gait. At 4.30 the animal vomited and purged several times. At 5 p.m. he was weak, dazed, and partially blind and deaf.

March 20th. Entirely blind at 6 a.m. At 3 p.m. clonic spasms, followed by paralysis of the hind legs. The retinal veins not much changed in size; the arteries mere threads.

March 21st. Completely blind and paralysed. Killed, and the usual organs removed and placed in Mueller's fluid.

Experiment No. 4.—March 22nd. Dog D; weight 25 pounds. Twenty-five grains of quinine given at 4 p.m. Normal fundus oculi.

March 24th. Dog completely blind, the arteries of the retina small, the disc pale, and in the right eye *the upper vein, just before it entered the disc, showed a constriction very much as if a thrombus had formed.* No similar change in the other eye, and no hæmorrhages. The dog's eyes

were prominent (slight exophthalmos), and the pupils widely dilated and irresponsive.*

March 25th. Dog completely blind. *In the right eye the circle of veins on the disc completely obliterated*, the arteries faint threads. No similar change in left eye. The dog was killed, and the usual organs removed and placed in Mueller's fluid.

Experiment No. 5.—March 24th, 4 p.m. Dog E; weight 23 pounds. Thirty-two grains of salicylate of sodium were given hypodermically.

March 25th, 4 p.m. No results in any way from the salicylate of sodium. The same dog was given 25 grains of quinine.

March 26th. No effect from the quinine. This is the first dog unaffected by a similar dose; thirty additional grains were injected.

March 27th. Dog completely blind. Paresis of hind legs

March 29th. Some return of vision. Optic discs pale and arteries small.

March 31st. The apparent slight return of sight remains: fundus oculi as before. The animal was killed at 5 p.m. and the usual organs placed in Mueller's fluid.

Experiment No. 6.—April 1st, 4 p.m. Dog F; weight 16 pounds. Thirty grains of quinine injected.

April 3rd. No effect on vision or general condition. Thirty additional grains injected.

April 9th. Although this dog has received 60 grains there is no effect of the quinine on the vision. Thirty more grains injected.

April 10th. Shortly after the injection of April 9th tremblings and paralysis of the hind legs appeared. To-day at 10 a.m. clonic convulsions began, and shortly afterwards the animal died. It was difficult to decide the amount of the blindness owing to the convulsion; this seemed complete, and the eyes were removed and placed in Mueller's fluid.

Experiment No. 7.—April 5, 4 p.m. Dog G; weight 20 pounds. One drachm of quinine was injected. The next day the laboratory was closed, and on the seventh the animal was found dead. The effect of the drug upon the vision was not ascertained, and the usual organs were not removed.

Experiment No. 8.—April 15th. A normal dog was killed, and the usual organs removed for microscopical examination and comparison with the portions taken from the "quinine dogs."

From this record it becomes evident that when quinine is given hypodermically to dogs in quantities varying from one grain to the pound to four grains to the pound, blindness, generally accompanied by other general disturbance, is apparent in from three to fourteen hours.

* This experiment is interesting in connection with the case of Voorhies, in which, a week after the poisoning, there was not a trace of the optic nerve vessels.

The exact date of the onset of the loss of vision was not determined; the earliest date of its appearance after injection which was noted was three hours. The blindness remained practically complete in one animal 29 days after a single injection of $3\frac{3}{4}$ grains to the pound. In one there was slight return of vision after 36 hours of blindness. The effects of the drug were more surely and quickly obtained when the carbamide salt was employed than when the bisulphate was used. A dose exceeding $3\frac{3}{4}$ grains to the pound produced death (Experiment 2); one animal perished (Experiment 7) when the dose was 3 grains to the pound. One dog (Experiment 6) resisted $1\frac{7}{8}$ grains of quinine to the pound given on two successive days, but succumbed when a third similarly proportioned dose was administered. In a single experiment (Experiment 5) salicylic acid in the proportion of $1\frac{1}{2}$ grains to the pound produced no result on vision. In these animals the ophthalmoscopic feature was similar to that seen among human beings with quinine amaurosis, and in one there was complete obliteration of the vessels on the optic disc, and in another blurring of the edges of the optic discs. In all, the pupils were immovably dilated.

The specimens which were removed for microscopical examination were prepared by hardening in Mueller's fluid, and sections were cut by the paraffine method. The stains were borax carmine, indigo carmine, and degenerations were sought for by the aid of Weigert's method. All the preparation of the sections was carefully done by Dr. William M. Gray in the laboratory of the Army Medical Museum. In brief, it may be stated that no very gross lesions, with one exception, were present in either the cross sections of the nerves, or in the optic nerve entrances, or the retinae. The exceptions were those sections taken from the right eye of dog D (Experiment 4). Here there was decided dilatation of the blood-vessels, and the central vein plugged with a clot, with long fibrin prolongations,

while white thrombi filled the smaller veins. (Fig. 1.)



FIG. 1.

CROSS SECTION OF OPTIC ENTRANCE IN DOG D, SHOWING CLOT IN CENTRAL VEIN AND WHITE THROMBI IN SMALLER BRANCHES.

Thus microscopically is demonstrated what had previously been noticed with the ophthalmoscope, namely, the appearances as if a thrombus had formed. In the other nerve entrances there was some dilatation of the blood-vessels, but to a very much smaller degree. The transverse cuts of the nerves did not exhibit any marked lesion. In a few there appeared to be some slight increase in the connective tissue; in others the nerve bundles between the trabeculae of connective tissue were wider (see Fig. 3) than those of the normal

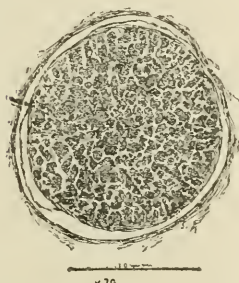


FIG. 2.

CROSS SECTION, NORMAL OPTIC NERVE IN A DOG. WEIGERT'S STAIN.



FIG. 3.

CROSS SECTION OF OPTIC NERVE OF DOG BLIND FOR 29 DAYS, SHOWING SPREADING OF FIBRILS. WEIGERT'S STAIN.

animal (see Fig. 2), and the individual fibrils of the

fasciculi were less marked and more spread apart, as if the tissue was œdematous and swollen out (Figs. 2 and 3).

There were no discovered lesions in the retinae. Weigert's stain failed to show any such degeneration as might have been present from an atrophy ; neither were there any appearances indicating neuritis. The optic chiasma was in each case normal in every respect. In the sections taken from the cuneus, in all instances the same lesion was present ; namely, a remarkable dilatation of the pericellular lymph spaces, with degeneration of the protoplasm of the cell. This lesion was probably most marked in the dog that had been longest blind. In presenting this fact, I do so perfectly aware that imperfections in the hardening process might be responsible for equal appearances.* I simply state this as a fact, and am unprepared to support it in any way as rendering definite knowledge of the lesion in quinine blindness. I am exactly in the position of him who has found associated with a certain disease a micro-organism, but who has been unable to prove more than this association. Very many more experiments, and very many more careful comparative microscopical studies must be made to show positively that any of the various lesions which I have described exist constantly in quinine blindness, and these few have been recorded as results so far obtained in a research which is only in its infancy. Numerous experiments are now under way, the results of which will be detailed in a future paper. So far as the microscope is concerned, it may be said that, with the single exception of the positive clot found in the central vein, no absolutely positive microscopic lesion was made out ; that is, none that might not be attributed to imperfections in technique. As negative evidence, however, it may be stated

* Possibly the convulsions produced this, but it was present in animals without convulsions.

that even in dogs blind for more than a month there is no atrophy of the nerve fibres in the sense in which we ordinarily use that word; neither is there any appearance in the earliest stage of the blindness of neuritis. It is not unlikely that the conjectures of those who have placed the lesion in the optic nerve between the chiasma and eyeball have come near the truth, and that there is really a species of œdema. At the same time, the influence of quinine upon the peripheral circulation must not be forgotten, and the fact that, as I have shown microscopically, under its influence a clot may form in the central vessel. It is probable that this is an extreme case, and that should such an example occur in a human being, recovery from the blindness would not be obtained.

EUGEN STEINACH (Prague). Researches in the Comparative Physiology of the Iris.—*Arch. f. Physiol. (Pflüger)*, Bd. XLVII., Hfte. 6, 7, 8.

The present communication, which apparently forms the first of a series of papers giving the results of Steinach's investigations, deals with the "motions of the iris in vertebrates, and the relation of pupillary reaction to the decussation of the optic nerve fibres in the chiasma." The author writes in the 52 pages of his article with a fulness of detail which excites simultaneously feelings of admiration and weariness in his readers. We shall not attempt to give more than a very brief abstract of the more important and interesting parts of the paper.

Steinach has examined a large number of fish, amphi-

bians, reptiles, birds, and mammals, with reference to—
(a) the completeness or incompleteness of the decussation of the optic nerve fibres at the chiasma ; (b) the presence or absence of the *direct* and *consensual* reaction of the pupils to light. The animals examined and the results as regards the pupils are given in tabular form.

(1) *Fish*.—Those examined, with two exceptions, belonged to the Teleostei. In the majority of these the optic nerves cross one over the other; in some, as the herring, one nerve splits and the other passes between its two divisions; in others (*e.g.*, the bream) each nerve divides into several strands, which cross in the interspaces between those of its fellow. The decussation is complete. Although the examination of the pupils presented great difficulty, the author satisfied himself that they reacted directly to light, contracting on exposure and dilating when shaded; no consensual reaction could be demonstrated. The iris in the fish contains a very limited amount of muscular tissue; no power of accommodation similar to that in the higher vertebrates exists, the eyes when at rest being adapted for near objects.

(2) *Amphibia*.—The decussation of the optic nerves, as in the former group, is complete. The nerves at the chiasma divide into a larger or smaller number of strands (*e.g.*, six in the frog) which interlace. Direct pupillary reaction to light was demonstrated in six different species examined, but no consensual contraction or dilatation could be proved. The sphincter pupillæ is generally rich in smooth muscle fibres, and, in contradistinction to fish, a slender ciliary muscle is present.

(3) *Reptilia*.—In this group also, complete decussation of the optic nerve fibres occurs. The pupil reacts to light, but only on direct exposure; no consensual reaction obtains. The muscular tissue in the iris is well developed, and the ciliary muscle is much more powerful than in the amphibians. In the turtle the author found, for the first time in the upward scale of animals examined, constant minute oscillatory movements of the iris when exposed to steady light; the condition known as *hippus* in man and the higher animals.

(4) *Birds*.—According to nearly all previous writers,

there is in birds, as in the lower vertebrates, complete decussation at the optic commissure. Steinach agrees with this statement ; his examination of 22 species led him to the conclusion that no consensual pupillary reaction occurs in birds ; direct reaction to light is generally well marked. Gudden has asserted that "in all animals whose visual fields are separate the optic nerves decussate completely, and that in all animals (as in man) whose visual fields overlap, decussation is only partial." Steinach disagrees with this ; as he points out, it has been certainly shown that in the owl there is complete crossing of the nerves, and it is almost as certain that the visual fields in this bird overlap.

(5) *Mammalia*.—Much diversity of opinion has existed concerning the decussation of optic nerve fibres in mammals. It was till recently maintained by certain observers that in all vertebrates, including man, the fibres crossed completely, but most investigators now hold that in the higher mammals and in man the decussation is partial ; that an uncrossed bundle connects the retina with the optic tract of the same side. Clinical and pathological evidence in man supports this view, of which Gudden has been one of the most zealous upholders.

In reference to this point, mammalia may be divided into two groups—(1) with complete decussation, (2) with partial decussation. The uncrossed bundle first appears in the rodents, but is not present in all, and first becomes well marked in the beasts of prey. Steinach examined a large number belonging to each of the above groups : the horse, mule, zebra, cow, sheep, goat, and deer, and rats, mice, and some other rodents, in which complete decussation occurs ; rabbits, dogs, cats, beasts of prey, apes and man, in which partial decussation has been proved. In the former group only one-sided direct pupillary reaction to light was present. No consensual reaction could be found.

He concludes from his researches and previously published statements that in all animals with complete crossing of fibres at the chiasma—and this includes all vertebrates below the mammalia, and a fair proportion of this class—consensual pupillary reaction is entirely wanting ; that in all animals with total decussation the two pupil con-

tracting centres are separate and unconnected, that the reflex paths for this reaction are entirely separate, and that the centripetal and centrifugal pupillary fibres for each eye cross completely.

In rabbits, in which partial decussation takes place at the chiasma, no consensual pupillary reaction was obtained. How is this to be explained? Gudden found in rabbits and some other animals two sets of fibres in the optic nerves, which he distinguished as pupillary and visual. The former, thought to be concerned only in the reflex pupillary reactions, he traced to the corpora geniculata externa; the latter, subserving vision alone, and smaller in calibre than those just mentioned, go to the upper corpora quadrigemina.

The lack of consensual pupillary reaction in rabbits may be accounted for by the absence of pupillary fibres in the uncrossed bundle, and some experiments of Gudden and Knoll support this hypothesis.

It would thus seem that rabbits, and other animals in which similar results were obtained, are, so far as the pupillary fibres of the optic nerves are concerned, in a similar position to those animals with total crossing of the optic nerves at the chiasma. In the gradual change from complete to partial decussation the uncrossed bundle consists at first of visual fibres only, as in rabbits; as we ascend the scale both visual and pupillary fibres share in its structure. One-sided (*i.e.*, *direct*) pupillary reaction to light is an indication of total decussation of the pupillary, but not necessarily of the visual fibres.

In most of the higher vertebrates, such as those of the canine and feline species, apes and man, there are both direct and consensual reaction of the pupil to light. This was till recently, especially in man, thought to be sufficiently explained by the semi-decussation in the optic commissure; but it is now manifest that anatomical evidence of partial crossing of the optic nerves is not adequate explanation, without knowledge of the course of the pupillary fibres. Gudden's researches have apparently proved that in the higher mammals the crossed and the uncrossed bundle each contains a large number of pupil-

lary fibres. Section of one optic tract in animals, and certain cases of disease in man, with hemiopic pupil reaction, show that loss of conductivity in one tractus does not prevent the transmission of reflex stimuli from one retina to both irides, and that therefore the semi-decussation of the pupillary fibres will not alone suffice to elucidate consensual pupillary reaction. This gap in the explanation has been filled by proof of the partial crossing of the third nerve fibres, and by the discovery in cats' brains of the commissural fibres (Nussbaum) connecting the centres of the two third nerves.*

It would thus seem that in the higher mammalia the bilateral action of pupils to light impinging upon one retina is connected with partial decussation of (1) the centripetal (optic nerve) and (2) the centrifugal (oculo-motor) fibres, and with (3) the commissural fibres between the two third nerve nuclei.

The retention of direct and consensual pupillary reaction after division of one tractus has been explained in yet another way by Bechterew. He concluded, from his experiments in dogs, that the tractus contained no pupillary fibres, but that these fibres passed from the chiasma directly to the grey matter surrounding the third ventricle, and thence to the nucleus of the third nerve. The researches of Gudden and others, proving the partial crossing of the pupillary fibres in dogs, are in entire opposition to this view.

Darkschewitsch, in very recent experiments, has traced the pupillary fibres in the tractus to the pineal gland, which is connected with the oculo-motor nucleus by fibres in the "ventral part of the posterior commissure."

Steinach gives some results in reply to the question: In animals with bilateral innervation of the iris, is the consensual equal to the direct reaction of the pupil? In cats and dogs and in man he has found the reactions equal; in this he concurs with the statements of Heddæus.

The paper is ended by a series of conclusions drawn from the evidence obtained by himself experimentally, and that

* In reference to this point consult Foster, *Handbook of Physiology*, 5th Ed., Pt. III., Fig. 114.

published by previous writers upon this subject. They are, in brief, as follows :—

- (1) In all cases of vertebrates, as high as rodents, there is total decussation of the optic nerve fibres; and in all such there is direct, but there is not consensual, pupillary reaction to light.
- (2) In animals with total decussation there is complete separation of the pupil-contracting centres and of the reflex paths, centripetal and centrifugal, for the pupillary reactions of the two eyes.
- (3) In some animals, with partial decussation at the chiasma, the pupillary fibres of the optic nerve cross completely, and in these the pupillary reactions are the same as in those with total decussation.
- (4) One-sided pupillary reaction is physiological evidence of total crossing of pupillary fibres and complete separation of the two reflex paths.
- (5) Consensual pupillary reaction is first met with in animals in which pupillary fibres are found in the uncrossed bundle. There are, however, other means of connection between the reflex paths for the two eyes.
- (6) Constant slight pupillary movement (hippus) is present in many vertebrates lower in the scale than man; it is easily observable in many mammals and birds, and in some amphibians.

J. B. L.

KÖNIGSHÖFER & MASCHKE (Stuttgart). On the Action of Koch's Remedy in Eye Diseases.—*Reprint from Deutschen Medicin. Wochenschrift*, No. 2, 1891.

The action of a new remedy can hardly be learned within a period of fourteen days, but the authors of this paper have in that space of time obtained results with Koch's remedy which in their opinion justify immediate publication.

Ten cases treated in Dr. Königshöfer's eye institution at Stuttgart are minutely described. A very brief epitome will suffice for this preliminary notice. In each case, before Koch's remedy was employed, the patient had been treated by ordinary methods, but without satisfactory or lasting result. From the time of the first injection all other treatment was suspended. The amount of the first injection was in every case 0.5 mgrm.; that is, one-half of the amount usually spoken of as the minimum dose. A second injection was given in five of the cases, the dose being the same as before in two cases, increased to 1.0 mgrm. in the three others.

Case 1.—A woman aged 35. Serous iritis, which had more than once recurred after treatment; ciliary injection, precipitate on posterior surface of cornea, yellowish-brown nodules on iris, posterior synechia, diffuse opacity of vitreous, roundish red or white and pigmented patches, about one quarter the size of the papilla, scattered over the fundus, tension normal. The local effect of two injections was an increase of the ciliary injection, with pain and lachrymation, tenderness on pressure in the ciliary region, a doubtful reduction of tension, and at the same time a rapid diminution in the size of the nodules on the iris and the deposit on the cornea, clearing up of the vitreous, and shallowing of the anterior chamber. The case remained under treatment.

Cases 2 and 3—*Iritis*.—Diagnosed as syphilitic. No reaction either general or local.

Case 4.—A man aged 24. Swellings at the margin of upper lid, with redness of skin and conjunctiva in the

neighbourhood, and slight purulent secretion. An injection given as a means of diagnosis between tuberculosis, amyloid degeneration, and multiple chalazien. General but no local reaction. A second injection gave the same result, except that the inflammation of the lid began to diminish on the following day.

Case 5.—A woman aged 22. Diagnosis, trachoma ; but as one eye only was affected, and had remained so for two years, suspicion arose that the disease might be tubercular. Between the third and fourth days after the injection, swelling of the upper lid, and purulent secretion occurred. After a second injection the lid swelled again, much lachrymation with some discharge of matter occurred, the conjunctiva was much reddened, the pannus much increased, the previously clear portion of the cornea diffusely clouded, the corneal margin surrounded by numerous small clear vesicles. Five days after the second injection, marked improvement in all the foregoing respects, and the follicles previously seen in the retrotarsal fold almost invisible.

Case 6.—Girl aged 15. Interstitial keratitis with much ciliary injection. Local reaction occurred each time after two injections, and resulted in a diminution of the opacity in the peripheral parts of the cornea.

Cases 7, 8, 9 and 10.—These were all instances of "eczematous corneal ulcers in so-called scrofulous children." The idea of treating such cases with Koch's remedy arose through an observation made by Professor Sigel in the Royal Olga Hospital: in a child treated by Koch's remedy for glandular tumours, a co-existing corneal ulcer healed with remarkable rapidity without further treatment.

Four children were selected presenting corneal ulcers of serious or obstinate character. In each instance the injection was followed by well-marked local reaction: at first, an increase of vascular injection, conjunctival secretion, lachrymation, etc., and in two cases the appearance of numerous vesicles around the corneal margin; shortly afterwards, an improvement in all these respects, and a rapid healing of the ulcers.

The authors summarise their results as follows :—

1. We have in all cases, with the exception of the two of syphilitic iritis, obtained a distinct general reaction after a minimum dose of Koch's remedy, and in all these cases but one, a considerable rise of temperature. In all these cases, therefore, we were able to demonstrate the presence of tuberculosis.

2. In all cases which presented the general reaction we observed also a well-marked local reaction in the diseased part of the eye.

3. In all these cases we observed a considerable improvement, and in the cases of corneal ulcer a complete healing, as the result of the local reaction.

Finally, the authors point out that the now well-known changes produced in parts of the skin affected by lupus find their analogues in those which are produced in cases of corneal ulcers—increased irritation, injection, and purulent secretion; the outbreak of minute phlyctenulæ at spots which previously appeared healthy; then the cleansing of the ulcer by the casting off of the diseased tissue, and the rapid filling up of the loss of substance.

P. S.

HIRSCHBERG (Berlin). Retinal Changes in Old Age.—*Centralblatt f. prak. Augenheilk*, Nov. 1890.

This is a short report of a careful ophthalmoscopic examination in the case of 50 patients, of ages varying from 60 to 80 years. The inquiry was undertaken with the object of specially noting the fine retinal changes which are probably closely connected with senile degeneration, but abnormalities of all kinds are included in the table given below, early lenticular opacities alone excepted. The patients were chosen from those who came for spectacles, and who believed that they had good eyes; all cases where obvious disease was present, or even suspected, being excluded.

Homatropine was used in each instance to dilate the

pupil, so that the examination should be as complete as possible. Of the 98 eyes examined, only 22 were found normal, and this irrespective of fine striæ in the lens, which were present in nearly all the cases. The following table gives the nature and proportion of the various diseases detected.—

Fifty patients (98 eyes) examined.

	Patients.	Eyes.
Normal	7	22
Vitreous opacities (in one case glancing) . .	13	19
Degeneration near the disc	10	17
Fine central changes	4	4
Distinct central retinitis	23	34
Peripheral changes	5	9
Hæmorrhage on the disc	1	1
Retinal hæmorrhages	1	1
Crystals on the retina	1	2
Senile atrophy	4	8
Vascular changes	25	40

These last include alterations in the calibre of the vessels (narrowing of arteries, dilatation of veins), white lines along the walls, etc. The second table given in the paper shows the proportion of men and women affected, and this we do not quote; but the following is of interest, as evidence of the apparently uncertain effect which this form of central retinitis may have on vision. In 12 persons, fine central retinitis was detected in one eye only. Of these cases, 3 are excluded, owing to the presence of other complicating changes; and of the 9 remaining, the vision is as follows:—

No.	Affected Eye.	Unaffected Eye.
No. 12	$\frac{2}{3}$	$\frac{2}{3}$
" 13	$\frac{2}{3}$	$\frac{1}{2}$
" 17	$\frac{2}{3}$ (incip. catar.)	$\frac{2}{3}$ (incip. catar.)
" 25	1	$\frac{1}{10}$ " "
" 30	1	1
" 34	almost 1 (incip. catar.)	$> \frac{2}{3}$ (incip. catar.)
" 36	1 " "	$\frac{2}{5}$ " "
" 38	1	1
" 39	$\frac{2}{3}$	$\frac{2}{3}$

The author concludes his report with the suggestion,

that in homes and institutions specially set apart for the aged, a much more extended examination of a similar nature might profitably be made.

N. M. ML.

E. MEYER (Paris).—Some Remarks on Sympathetic Ophthalmitis. *Révue Gen. d'Ophthalmol.*, Nov. 1890.

The paper begins with a short reference to Deutschmann's experiments on this subject, and his theory that in all cases of sympathetic ophthalmitis (irido-cyclitis) the infection is conveyed to the sympathising eye by micro-organisms which travel by way of the optic nerves and chiasma. Although, as the writer points out, other experimenters have been unable to reproduce Deutschmann's results, he does not doubt their accuracy, but cannot accept deductions drawn from experiments on rabbits as holding good in the case of man; nor does he admit that, even if in man the presence of micro-organisms can be proved in the second eye, they must necessarily have got there through the commisure. In support of his first contention, Meyer compares the very different nature of sympathetic inflammation as induced in rabbits and as known in the human subject, the change in the former being almost always limited to a papillitis. Deutschmann's explanation of this fact—viz., that death occurs in the rabbit too soon after the inflammation has been set up to allow it to spread forwards to the anterior parts of the globe—is not considered by the author as thoroughly satisfactory. Other well-known differences in the behaviour of the disease in the two classes of cases are pointed out, but it is unnecessary here to refer to them. In opposition to Deutschmann's belief, that the optic nerves and chiasma form the pathway of communication for the disease between the two eyes, Meyer cites the case of sympathetic ophthalmitis examined post mortem by Becker, in which no trace of alteration was found in any part of these organs, and therefore, he says, in this case at least, the transmission of the infection cannot have been

along the nerves and commissure. He alludes on the other hand to the pathological changes which have been detected in the ciliary nerves, more especially to those described by Uththoff, and while not committing himself to the theory of transmission by these nerves, considers the changes referred to as a certain amount of evidence in its favour. Although the writer is thus unable to admit Deutschmann's conclusions, he fully allows that the *anatomical possibility* of transmission along the optic nerves has been proved by the experiments and observations both of Deutschmann and Gayet : beyond this point, however, he does not think the present state of our knowledge permits us to go.

Leaving the theoretical side of the question, Meyer proceeds to consider the treatment of the disease ; this we may shortly summarise as follows. He strongly advises enucleation of all globes whose vision is definitely lost, and from which any fear of sympathetic inflammation may be apprehended ; he alludes to the three operations, other than enucleation, which have been frequently practised—viz., evisceration of the globe, section of the ciliary nerves, and section of the optic nerve. With regard to the first of these, the reaction is much greater than in total excision, the result considerably less safe, and the advantages claimed for the stump he considers at the best doubtful. Section of the ciliary nerves as a preventive measure against sympathetic ophthalmitis, Meyer declares to be quite unsuitable ; he has, however, often done this operation with good effect in cases of irido-cyclitis (non-traumatic), and also in glaucoma, where the eye is completely lost for vision and is at the same time subject to periodic and very painful inflammatory attacks. Of the operation of resection of the optic nerve our author has no personal experience, but he instances the large number of cases done by Schweigger of Berlin, apparently with a very satisfactory result ; he considers our experience of this method still too small to warrant us in adopting it as a regular procedure in preference to excision. Towards the end of his paper the writer gives details of a case of perforating wound in which the injured globe was removed twenty-four hours after the accident happened, but notwithstanding this very short interval of time, definite symptoms of sympathetic inflam-

mation occurred in the other eye more than seven months later. The facts are shortly as follows :—The patient presented himself on Sept. 19th, 1889, saying that his left eye had been struck by a small piece of iron; there was a large corneal wound, prolapse of iris, rupture of lens capsule and total loss of vision. The eye was removed, as stated above, within twenty-four hours after the injury; healing took place naturally in a few days. On the 7th of May, 1890, he returned, complaining of the other eye. Examination showed keratitis punctata, posterior synechiæ, and cloudiness of vitreous, so that the disc was only dimly seen; vision and field were much reduced: his general health was perfectly good, and there was no cause other than sympathetic inflammation to which one could attribute the present attack. It should be added that, as the stump of the excised eye was rather sensitive to pressure, it was thought advisable to remove a further portion of the optic nerve, and this was done. The man recovered perfectly; treatment consisting in mercurial friction, very hot applications, and hourly instillations of atropine or duboisin.

N. M. ML.

OPERATIONS UPON EYES BLINDED BY SYMPATHETIC OPHTHALMITIS.*

BY JOHN B. STORY.

However much ophthalmic surgeons may differ in their views on other questions, they are unanimous in this, that any operation whatever is a most dangerous proceeding when it is undertaken upon an eye which is, or has been, affected by sympathetic ophthalmitis. But, in spite of the unfavourable chances, operations have to be risked when an eye is blind and useless, and nothing but an operation can succeed in restoring to it some modicum of sight. The present paper is brought before the Academy in order to attract the attention of the profession to the method of operating upon eyes blinded by sympathetic ophthalmitis which was advocated by the late Mr. Critchett, and which I have for some time past been employing in suitable cases, and, indeed, in some unsuitable cases also.

During the actual presence of sympathetic inflammation no sane man ventures to perform any operation, unless, indeed, as sometimes happens, the intra-ocular pressure rises to such an extraordinary height that something has to be done without delay to avert absolute blindness from glaucoma. I shall only incidentally comment upon the operations to be tried in these cases. My desire is to treat of the operative measures that can be adopted at a later period, when all inflammatory signs have totally disappeared, and when the eye, though so blind as merely to possess perception of

* Read before the Royal Academy of Medicine in Ireland,
Dec. 12th, 1890.

light, is still sufficiently healthy to justify the hope that some more sight may be restored to it by operation.

There may be said to be three possible terminations to sympathetic inflammation. The eye so affected may either (1) get well, and retain useful—nay, perhaps perfect—sight; (2) become phthisical, and collapse, owing to the contraction of the plastic exudation in its interior, when it becomes hopelessly blind; or (3) retain its shape and tension, but have its iris bound down by extensive adhesions to its lens—probably by ring-adhesions—and have its lens opaque and its vision reduced to mere perception of light. When an eye is found in this condition, the question of operation becomes important. If nothing is done, the eye remains blind and useless.

We must consider what changes have taken place in the interior of the globe. First, what we can see. The iris has been seriously inflamed, and is now in a partially atrophic condition, its tissue little better than cicatricial, with atrophy of its muscle and dilatation and rigidity of its blood vessels. The anterior capsule of the lens is thickened by inflammatory exudations from the iris, and the lens is opaque and shrunken, or shrinking. The vitreous we know has been inflamed too, and is probably to a large extent fluid, and perhaps not perfectly transparent, and the retina and choroid have probably been also inflamed, and have lost much of their normal histological appearances and functions. There may also be a more or less defined cyclitic membrane spreading over the posterior surface of the lens; but we assume that there is not, for if there were, the globe would be contracting, and the case practically hopeless.

It is obvious that the main cause of the blindness in such an eye is the presence of the opaque lens, and the question to be determined is, can this opacity be removed? and if it can, what is the best method of operating?

The extraction of the lens in a case of this kind must be accompanied by a pretty large iridectomy, as the iris is always extensively adherent to the lens, and, indeed, the adhesions will have to be divided all round the pupil before the lens can be removed. A mere iridectomy at one side of the pupil will not be enough to free the lens sufficiently. An operation of this kind produces a great deal of hæmorrhage from the divided and ruptured vessels of the iris, and it very frequently happens that the hæmorrhage remains in the pupil and never becomes absorbed; it becomes organised, and forms a new secondary cataract or iritic membrane, which has to be operated on itself in its turn, leading to fresh hæmorrhage and formation of fresh iritic membrane after this secondary operation. The reaction that follows such extensive interference with the eyeball as is necessary in performing an extraction with iridectomy in these eyes is always considerable. Whether we believe, as some do, that the spores of old microbes are lying in the globe, just waiting for some stirring of the soil to take on growth, or not, we may at least allow that the seeds of inflammation in some shape or form are there, and the less we meddle with their seed-bed the better. These eyes are "vulnerable," and very little surgical interference easily leads to destructive inflammation in them.

There is another danger involved in extraction operations, and even in simple iridectomies, to which little attention has been paid, and which is a very serious danger indeed, as two of my cases unhappily testify. I allude to the danger of the loss of a large quantity of vitreous. This must always be expected in extractions performed on sympathising eyes, and may also occur to a fatal amount in simply performing iridectomy.

The unsatisfactory results of iridectomy in these cases have been so frequently demonstrated in ophthalmic practice that it is easy to find in most of the

text-books statements almost strong enough to induce us to lay down the principle that an iridectomy should never be done in such an eye—*e.g.*, Mr. Swanzy (2nd edition, p. 235):—"Of the operations employed for the establishment of an artificial pupil in an eye which has suffered from sympathetic ophthalmitis, resulting in anterior phthisis, iridectomy most naturally suggests itself, and is the least satisfactory." What the least unsatisfactory may be he does not state, but he describes *v. Graefe's* combined iridectomy and extraction, and mentions *de Wecker's* iridectomy with approval. He also describes Mr. Critchett's method of the double-needle operation, but, erroneously as I think, states that the needle is to pass through the iris as well as the lens capsule. Mr. Critchett is careful to avoid the iris, as can be seen by anyone who reads the original paper. *De Wecker*, in *Graefe and Saemisch's "Handbuch,"* speaks of iridectomy as inadequate, even in the most apparently favourable cases, to establish a free pupil without at the same time dealing with the lens and its capsule. Now, as we can operate on the lens and its capsule without interfering with the iris, if we adopt Mr. Critchett's plan of dealing with these cases, it seems to me a very rational proceeding to do the lesser rather than the greater operation in eyes which all men agree in considering very unfavourable subjects for any operation.

It is curious in this connection to observe that the text-books generally treat of operations on the iris to be performed for the results of sympathetic disease, although it is universally acknowledged that the results of such operations are unsatisfactory; and it must also be plain to any man that the lens is the real obstruction to vision, and is the structure which should be attacked. The late *Albrecht v. Graefe* saw this, and actually proposed, in his operation mentioned above, to extract even transparent lenses in these cases—a proposal which has not indeed found many supporters.

If it is dangerous to extract the lens, with or without an iridectomy, there is only one other course open to us, and that is to divide the anterior capsule of the lens with a cutting needle, or, if necessary, with two such needles. This is the method advocated by the late Mr. Critchett in a paper published by him in the "Ophthalmic Hospital Reports" for June, 1881. In it he gives the details of two cases successfully treated by him in this manner, one of them twelve years and the other five years after the original injury. I am aware that many cases are on record where operations of various kinds have been more or less successfully performed on eyes suffering from or blinded by sympathetic ophthalmitis. In seven out of ten cases where iridectomy was done during the presence of sympathy, a more or less satisfactory result was obtained. (*vide* "Trans. Oph. Soc.," vol. vi.: Report of Committee. Eleven cases are quoted, but one is doubtful.) In three of these seven the lens had to be extracted or needled subsequently. In the same volume Mr. Gunn publishes a successful case of iridectomy, combined with discission and extraction, and the same author published, in "Oph. Hosp. Reports," vol. xi., a series of cases of sympathetic disease, in twelve of which iridectomy was done. Six cases had iridectomy alone performed, and four of these were unsuccessful; six had iridectomy combined with extraction, and three of these were unsuccessful.

Before submitting the following cases in illustration, not so much of the great advantages of Mr. Critchett's method as of the extreme difficulty of operations of all kinds upon eyes blinded by sympathy, I should state that Mr. Critchett's operation is almost exclusively adapted for young eyes, not for those of the middle-aged; but it is commonly only young eyes that offer any chance of successful surgical interference after an attack of sympathetic ophthalmitis.

Case 1.—In this, after repeated needle operations, I had to have recourse to an iridectomy, with satisfactory result.

Edward J., æt. 24. (Oct 1887.)

Lost his left eye by a blow in 1881. The right affected about six months afterwards. An inmate in a blind asylum.

Left.—Collapsed from plastic inflammation after a rupture of corneo-scleral margin. T.—2. Is not tender on pressure; phosphenes obtainable, but V.=0. A greyish reflex in pupil, and retina detached. Right.—Very shallow ant. ch. Almost total synechia posterior, but with a localised cystoid bulging at upper margin of iris. Very small pupil, lens opaque with thickened capsule. No illumination of fundus. T.n. or — (?) V.=p.l. Proj. good.

The capsule was needled in the eye on Nov. 5th and Dec. 5th. Some hæmorrhage occurred at the second operation, and it was also followed by an attack of conjunctivitis. He returned to hospital in March, 1888.

Vision=hand reflex.—Conjunctiva reasonably healthy. (On leaving hospital it looked not unlike a case of granular conjunctivitis. Eye otherwise unchanged.

The capsule was needled on three separate occasions during March and April, one needle only being used, and hæmorrhage proceeding from the new-formed blood vessels in the pupillary area.

He returned again to hospital in August.

On this occasion I performed an iridectomy with de Wecker's scissors, leaving a fairly large black opening, and the patient counted fingers for the first time. On leaving hospital he could count fingers at $3\frac{1}{2}$ m. with + 14 D. Subsequently his vision was fingers at 2 m. and 2'60 without a glass, and no glass on that occasion improved it. He has since died.

Case 2.—Shows the comparative safety of the double-needle operation, and the dangers of any operation which necessitates a larger incision in the cornea.

Bernard H., æt. 26. (Jan. 1887.)

Right eye injured nine years ago; some nine weeks afterwards the left affected. The right since then enucleated, and he is now in a blind asylum.

Left (sympathising) eye shows no irritability. Anterior chamber is shallow, iris atrophic, adherent at pupillary margin to lens, the pupil being semi-dilated. T. — (?) V.=fingers at 0'3 m. Very faint ophthalmoscopic illumination.

Operation.—Division of capsule with two needles. The opening made not larger than a pin-hole, but vision raised to fingers at 0'5 m. Unfortunately I was not content with this result, and some three weeks later proceeded to tear the capsular membrane with

Noyes' hooks, instead of repeating the double-needle operation. During this operation so much fluid (vitreous) came out of the eye, that the globe quite collapsed before the patient left the operating table. I succeeded, certainly, in making a larger opening in the capsule, but at the cost of the sight of the eye, for the tension never rose again after the operation, and was registered — 2 on his leaving hospital and returning to the blind asylum.

This untoward result would not have occurred if I had been content to repeat the double-needle operation.

Case 3.—Thomas M'D., æt. 7 (Oct. 1887). A very unfavourable case indeed, which gained what we must regard as satisfactory sight.

Left eye injured by a thorn bush two years ago, and right affected for about three months, but more probably for a much longer period. Left collapsing after traumatic irido-cyclitis. V. = 0. Right not noted as irritable. Ant. ch. shallow; iris adherent at pupillary margin; lens opaque; T. — (?); V. = hand-reflex, and proj. good.

During four months five needling operations were performed on this eye, most of them with two needles, and on leaving hospital he could count fingers at 0.3 m. He was transferred to a blind asylum.

He returned to hospital in March, 1889; V. = fingers at 10 cm. only. Another needling operation was done, which raised V. to fingers at 0.5 m. He has since left the blind asylum.

Case 4.—James M. (July, 1888.) Operation produced no result.

Case 5.—This case exhibits the disastrous results of iridectomy.

Edward B., æt. 21. (April, 1888.)

Left eyeball ruptured, with prolapse of iris. Three weeks later came to hospital with right already affected, iris discoloured, synechia posterior, zonular vascularity; V. = 6/36; seven weeks after injury, left enucleated. Condition of right on leaving, T. + 1, V. = fingers at 2 m. Returned in Aug. 1889, with T. + 1, V. = fingers at 0.5 m; annular synechiæ posterior. An iridectomy was done with considerable hæmorrhage. This was not absorbed by Oct. 5th, when V. = p.l., T. + 1, and on leaving hospital T. — 2.

Case 6.—James C., Aug. 29, 1889.

Right eye struck by a knife eight years ago; is now collapsed. Left stated to be affected for more than a year, and is now nearly blind, evidently from sympathetic ophthalmitis. Cornea hazy from old keratitis punctata; iris now discoloured, annular synechiæ posterior, and the anterior chamber so shallow that iris also adheres to cornea. T.n.; proj. good, V. = p.l.

Aug. 31. Needling of capsule ; no hæmorrhage, but hyphæma occurred two days later, which slowly absorbed. On Oct. 5th T—3, and no opening visible in capsule. This is the only case in which the needling operation has done positive harm in my experience.

Case 7.—John E. (Dec. 1889.)

Right hurt eight years ago, and left sympathising with it since one year after injury. Refused at that time to consent to enucleation. Now has left T.—1, V.=p.l. ; cornea partly opaque ; anterior chamber shallow, annular synechia posterior, with iris touching cornea at periphery ; lens opaque ; proj. good. Dec. 18th, double-needle operation, and again Jan. 8th. No result noted. Operations very unsatisfactory, as corneal opacity prevented the points of needles being seen.

Case 8.—This case, though not an undoubted one of sympathy, illustrates the utility of Critchett's operation, and shows at the same time the fatal effects of iridectomy.

Ellen G. (March 22, æt. 28.)

Attending dispensary for some time with left eye almost blind from kerato-iritis, got in July last (1885). She says she had erysipelas in face, head, and neck ten years ago. Left V.=fingers at 0·5 m. She says the right eye has been bad just one week.

Right has pink zonular vascularity, iris discoloured greenish, = acute iritis, but no keratitis-punctata, and indeed more like iritis syphilitica than iritis sympathetica. V.=6/60.

She got a course of mercurial inunction till the gums were affected in about ten days' time.

April 12. No definite keratitis punctata, nor optic neuritis ; there is lymph on lens capsule.

April 14. R.V.=fingers at 6 m. ; L.V.=hand reflex. Right disc hazy from vitreous opacities ; no optic neuritis nor keratitis punctata.

April 21. Right pupil less well dilated ; cornea has a sort of gelatinous look ; iris deeply infiltrated with enlarged blood vessels in it. Subsequently extensive keratitis punctata developed in the right eye, and went on increasing in amount for some weeks.

May 5. R.V.=fingers at 2 m. L.V.=hand reflex.

May 22. L. no projection inwards ; proj. good elsewhere, annular syn. post., and some ant. syn. above. Upper ciliary region tends to staphylomatous bulging. T.n. very little vascularity left. I thought it best to postpone no longer an iridectomy on the left eye, and made one on May 22nd downwards and inwards. The final result of this operation was phthisis bulbi.

June 4th. R. well marked keratitis punctata, iris seemingly totally adherent to lens, very bad illumination. T.n.

June 7th. R.V.—fingers at 4 m.

June 21st. Right pupil much blocked by lymph, suspect syn. post. annularis, much keratitis punctata, slight zonular vascularity; can illumine, but no details. T.—(?); V.—fingers at 4 m.

She returned to hospital in Nov. 1888. The left eye was then collapsed. The right was hardly perfectly quiescent, even after more than two years. A pink blush was easily excited in the ciliary region. The anterior ciliary vessels were dilated. V.—p.l. proj. good; lens opaque; annular synechia posterior.

I decided to operate with two needles after Critchett's method, and did so on Nov. 8th, and again on Nov. 17th. On Nov. 25th the anterior chamber was filled with a most beautiful show of cholesterine crystals, which gradually disappeared. This operation was repeated on April 10th, 1889, and on April 17th her vision was fingers at 2 m. At present her vision is 6/36, with +16 D., and with +20 D. she can read Galezowski No. 1. (Nov. 29th, 1890)

Case 9.—This case, like that of Bernard H., shows the unexpected and fatal results which may follow an attempt at iridectomy.

Catherine J., æt. 26, (July 18th, 1890.)

I had enucleated the girl's right eye for old sympathetic disease some years before, and then done an iridectomy in the sympathising eye to relieve the annular syn. posterior. The iridectomy was most successful, and gave the patient useful sight for many years. This sight has been failing of late, owing to the formation of cataract. Present condition; left cornea slightly hazy, ant. chamber deep, annular syn. post., except where coloboma of iridectomy is situated above. V.—fingers at 0.5 m., T.n. or —(?). Lens opaque, and capsule chalky in appearance. No illumination.

July 19th. Attempted to do a second iridectomy downwards, so as to free the lens enough from the iris to allow of subsequent extraction. However, on withdrawing the iridectomy knife, a large flow of fluid vitreous followed it, so much, in fact, that the globe became collapsed, and the operation had to be abandoned. In fact, the lens was seen to be quite dislocated from ciliary body above, and to be only kept in place by its adhesion to iris.

It is obvious that any number of needle operations might have been performed without leading to such a fatal termination as even an attempted but not completed iridectomy led to.

In conclusion, I would lay before the Academy the following propositions, which may form the basis of discussion:—

1. That no operation should be performed on an

eye until all signs of sympathetic inflammation have disappeared, except the intra-ocular pressure be acutely glaucomatous.

2. If an operation have to be performed for glaucoma during active "sympathy," it should be a corneal or scleral incision, and no iridectomy should be attempted.

3. When all inflammation has disappeared, the best method of operating is that of Mr. Critchett, by which the iris is not wounded, hæmorrhage is reduced to a minimum, and the least possible occasion is given to inflammatory reaction ; and lastly, no large opening is made in the globe through which a fluid vitreous may escape, as it does occasionally during an iridectomy, in quantities sufficient to produce collapse of the eyeball.

J. WIDMARK (Stockholm). On the Eye-Symptoms connected with Peripheral Affections of the Fifth Nerve. *Klin. Monatsbl. f. Augenheilk.*, Sept., 1890, p. 343.

Many morbid conditions of the eye, for example, iritis, cyclitis, glaucoma, and refractive errors, give rise to pain which is not only felt in the eye itself but in the surrounding parts, especially in the regions in which the ophthalmic divisions of the fifth nerve are distributed. Such pains are no doubt due to reflex radiation from the nerve centre. The oculist sees cases of this kind every day and knows well that pains occurring in the parts around the eye are an indication for examining the refraction.

On the other hand, the eye-pains which are symptomatic of trigeminal affections, though by no means rare, have received less attention, and when, as sometimes happens, such reflex actions are associated with an abnormality in the eye, their nature is very apt to be misunderstood.

Trigeminal, like other forms of neuralgia, may depend upon a central or a peripheral cause; a peripheral cause may be either intra-cranial or extra-cranial. The object of the present paper is to point out the connection between eye-troubles and that form of trigeminal disorder in which palpable changes can be discovered in the cutaneous branches of the nerve. In a work on neuralgia of the head, Henschen has pointed out that cord-like thickenings are often to be felt in the forehead following the direction of the nerve-branches, and due to neuritis or perineuritis. He holds that these changes are usually produced by atmospheric influence and are of rheumatic nature. A wide extension of the pain in such cases is not necessarily a sign of central irradiation, but rather, he thinks, of a rheumatic affection spreading over considerable areas and not necessarily limited to the track of the nerves.

In an article on inflammations of the eye Rossander remarks that trigeminal neuralgia is a not uncommon cause

of conjunctival hyperæmia. He refers to persons who, after having been treated for catarrh of the conjunctiva for a long time without benefit, were cured by ten or fourteen applications of massage in the region of the nerves in question.

In pursuance of the same subject Widmark has carefully studied the eye-troubles which are met with in connection with trigeminal affections of the kind above referred to. The following is an abstract of his observations:—

Pain is common around the eye, especially following the distribution of the cutaneous branches of the fifth nerve to the forehead, the temple, and the nose. In other cases it is felt in the eye itself or deep in the orbit. Sometimes the patient complains of a burning sensation in the eye-lids. The pain is sometimes slight and dull, sometimes severe; it is sometimes continuous, sometimes intermittent, usually with irregular intervals, and liable to violent exacerbations.

Photophobia is sometimes absent, but more often present in greater or less degree, especially by artificial light. Reading, sewing, and other near work by artificial light are often very difficult.

Obscuration of vision during an attack of the neuralgic pain is often complained of, objects appearing as through a veil or mist, although the actual acuteness of vision as tested by letters may prove to be unaltered.

The eyelids feel heavy and are kept open with difficulty, especially the first thing in the morning. The patient prefers to sit with closed eyes.

Objective changes in the eyes are either absent or of slight degree. The commonest is a slight hyperæmia of the palpebral conjunctiva, sometimes associated with slight swelling of the lids. In exceptionally severe attacks lachrymation and injection of the ocular conjunctiva are added. In one case a slight chemosis was observed, in another a tenderness on pressure of the eyeball. In two cases movements of the eye were painful so that the patient could hardly look to one side without moving the head.

The attacks are brought on by various causes, especially by prolonged use of the eyes and by bright light. The patient may attribute the whole of his suffering to these

causes, and if an error of refraction is found to be present the case may very closely simulate one of accommodative asthenopia. Correction of the refraction may relieve to some extent but will not cure, and in some cases gives no apparent benefit. Again, together with the error of refraction, anæmia may be discovered and is likely to be regarded as the essential cause of the trouble, but constitutional treatment does not effect a cure. In a considerable number of such cases the eye-symptoms will be found to mask an affection of the periocular branches of the fifth nerve. Careful observation will show that the attacks are apt to come on independently of over-use of the eyes or bright light, and in connection with nervous excitement and atmospheric influences such as the exposure of the face to cold wind.

The affection appears to be about as often unilateral as bilateral. The youngest patient was 9 years old, the eldest 68. The majority were women and their condition much resembled that which Foerster has described as *kopiopia hysterica* — a reflex amblyopia due to chronic parametritis. This latter diagnosis should not be made in any case, even though some pelvic trouble may be present, until the terminal branches of the fifth nerve have been carefully examined.

The infiltration discoverable in the region of the fifth nerve is variable in its character. Occasionally it feels œdematous and pits beneath the finger ; more often it has a doughy feel, and in the most chronic cases is hard. In some instances it is cord-like and follows the direction of the nerve, in others it consists of more or less limited swellings. It is situated apparently in the subcutaneous connective tissue, though it is not unlikely that the deeper structures may be involved. In one case there was tenderness on pressure on the nerves together with subjective eye-symptoms, but no palpable tissue changes.

The nerves most frequently affected are the frontal, supratrochlear, and nasociliary.

The treatment employed in this series of cases was massage lasting about a quarter of an hour once daily, and consisting of rubbing and stroking, gently at first and

more forcibly by degrees, over the affected parts in the direction of the lymph channels; also pressure on the nerves at the specially painful spots. The co-existing anæmia was either left untreated for the time being, or was treated before the massage was begun, in order that the efficacy of the later might be fairly tested. For attacks of very severe pain antipyrine or antifebrin was occasionally given.

Prognosis in relation to eye-troubles connected with trigeminal affections of the kind described is very good, provided the treatment by massage is employed. It may happen that the first rubbing induces an attack of pain, but, as a rule, there is decided improvement at the end of a week, and a complete cure is often achieved in from two to four weeks. The disorder may however recur.

It is not easy to determine the precise way in which peripheral affections of the trigeminus lead to eye-symptoms. Two ways may be imagined: the morbid process may extend into the ocular branches of the nerve, or it may induce the ocular symptoms by radiation from the nerve centre. The latter supposition appears the more probable both because objective changes in the eye are absent or nearly so, and because massage of the periocular branches quickly subdues the symptoms.

P. S.

TH. TREITEL (Königsberg). Further Contributions to the Study of Functional Disturbances of Vision.—*V. Graefe's Archiv.*, XXXVI, 3.

I.—THE CONDITION OF THE LIGHT-DIFFERENCE IN THE CENTRAL VISION OF AMBLYOPES.

Throughout this article the word light-difference (Unterschiedsempfindlichkeit) means the power of an eye to distinguish differences of illumination (Helligkeitsdifferenzen).

The apparatus used in determining this power is that described by the author in the *Centralbl. für Augenheilkunde*, 1885, page 4 (*vide* also *O. R.*, VIII., p. 367), and the results are numerically expressed according to the plan there suggested. The author found, however, that the normal standard proposed by him, which was the power of seeing No. 1 (3° white + 357° black) at 1 metre distance, is too low, and that many eyes are able to distinguish this No. 1 at 4 or 5 metres' distance, so that the L. D. may be diminished although No. 1 be recognised; on his observing this, the greatest distance at which No. 1 could be seen was noted in those cases where it could be seen at 1 metre, and a comparison made with the other eye when healthy. In testing the L. D., anomalies of refraction were corrected.

152 patients were examined. Of these there were :

25	cases of	Atrophia Nervi Optici
16	„ „	Retinitis
8	„ „	„ „ Pigmentosa
4	„ „	Hemianopia
16	„ „	Amotio Retinæ
26	„ „	Neuritis
23	„ „	Glaucoma
22	„ „	Choroiditis
12	„ „	Amblyopia Congenita

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Numerous cases of anomalies of refraction and of opacities in the refracting media were also examined.

A complete table of the 152 cases, with the L. D., vision, and colour-vision, etc. of each noted, is given, and in this table are also included 12 cases of anomalies of refraction, and 11 of opacities in the refracting media.

As the result of his researches, the author found that, 1st, a loss of central L. D. may occur in all forms of amblyopia—*i.e.*, in diseases of the fundus oculi—as well as in diseases of the optic nerve; and, 2nd, that the central L. D. in all forms of acquired amblyopia probably diminishes as soon as the central visual acuity becomes lessened. This latter statement is seemingly at variance with some of the cases cited, in which, with loss of visual acuity, the L. D. was

normal, but the author believes this to be owing to the normal standard taken having been too low, as above explained, and, in fact, in these cases the L. D. was always found lessened when comparison could be made with a sound eye. In amblyopia congenita ex anopsia, the L. D. and colour-vision were both found diminished, but less so than the visual acuity. In amblyopia from anomalies of refraction the results were less definite, and, indeed, in these cases, it is not possible to say whether the amblyopia is congenital or acquired without a lengthened series of consecutive observations. Errors of refraction caused a greater loss of visual acuity than of L. D. or of colour-vision.

Bjerrum has published two papers on this subject. In the first he arrives at the following conclusions: that in choroido-retinal affections there is a tendency to hemeralopia, and in optic atrophy to a loss of L. D., and that in congenital amblyopia there is no marked tendency to either of these conditions; central (toxic) amblyopia also causes a loss of L. D. These results differ from the author's, which difference he attributes to the different method of investigation employed. Bjerrum used at first letters of various shades of grey, but with these could not have detected a slight loss of L. D., the test not being delicate enough; subsequently, he made use of Donders' modification of Masson's shield, which test, however, makes a demand on the visual acuity as well as on the L. D. The test objects also used by Bjerrum subtended a much larger angle than those used by the author, and this explains the fact that, in choroido-retinal affections, where the defect is usually central Bjerrum found no loss of L. D.; whereas, in optic atrophy, where the defect is widespread, he found the L. D. diminished. This also explains why he found no loss of L. D. in amblyopia congenita, and, though it seems strange that with his method he should have found it diminished in central amblyopia, the fact could perhaps be explained had he published the cases from which he drew this conclusion, as in advanced cases the defect is often widespread. In his later writings on this subject, Bjerrum, though laying more stress on the importance of the angle subtended by the test object, does not seem to have varied his conclusions.

Samelsohn has also investigated the subject, using a Masson's shield. He concluded that in all intra-ocular diseases the L. D. may be diminished within wide limits, and that it is least so in diseases of the choroid. These results do not agree with the author's, nor does Samelsohn's statement, that in some amblyopes, with much diminished visual acuity, the L. D. is normal. This is probably accounted for by the larger angle subtended by the test-object used by Samelsohn, and this also accounts for the fact that he found a close relation between diminution of L. D. and contraction of the field of vision. Samelsohn himself remarked that, in central amblyopia, the L. D. was only found normal when the test applied was not quite central.

Samelsohn has also noted, and herein his results agree with those of the author, that opacities of the refracting media have comparatively little effect on the L. D., and that this fact may be of service in prognosis as in some cases of incipient cataract. That he found diminished L. D. in cases of marked ametropia would point rather to a loss of eccentric vision in the neighbourhood of the macula than to loss of central L. D., as this, as the author has shown, is but slight.

Samelsohn's and Bjerrum's observations, in fact, made with test-objects subtending large angles, are of more value, as determining the total than the central L. D., and that they do not agree as to choroirditis is, perhaps, owing to the larger number of cases examined by Samelsohn (500 instead of 50), which tends to minimise the error caused by exceptional cases.

Müller-Lyer has also published some observations, but the letters used by him as test-objects were of considerable size.

Krenchel has published a case in which, with contracted fields and normal visual acuity, the L. D., with Masson's shield, was found to be only $1/10$, but the angle under which it was tested is not given.

As to the method proposed by Seggel for estimating the L. D. by means of black letters on paper of various shades of grey, it is open to the objection, amongst others, that by it the total illumination (absolute Helligkeit) is varied, so that night-blindness, as well as loss of L. D., will cause failure to read the letters by daylight.

In conclusion, the author believes that diminished L. D. is not pathognomonic of any forms of amblyopia, but is rather—as are loss of visual acuity and of colour-vision (quantitative)—a symptom of diminished functional activity. He intends, in two other articles, to give the results of his investigations on the influence of diminished illumination on the vision of amblyopes and on their visual acuity, colour-vision, and L. D.

J. B. S.

PERLIA (Frankfurt-a-M). Description of the Macroscopic Changes in the Mid-brain and 'Tween-brain of a child with congenital Amaurosis. *Arch. f. Ophthal.*, XXXVI. iv., p. 217

The author obtained for examination the brain of a male child æt. one and a-half years, who died of marasmus. He had seen the child a few days after birth, and found the pupils widely dilated and motionless to light. A yellowish-white reflex was visible through the transparent lenses, and was derived from the irregular surface of an opaque mass situated in the front part of the vitreous. During the eighteen months of the child's life, posterior synechiæ formed, the tension became subnormal, and the lenses became partially opaque. At the time of death both eyeballs were shrunken, the left much more than the right; microscopic examination showed the results of chronic inflammation of the uveal tract. The patient was the eighth child; two others born blind had died in infancy.

The brain was removed from the skull ten hours after death, and hardened in Müller's fluid. With a view of ensuring accuracy, the brain of a previously healthy child of nearly the same age was obtained, hardened in the same way, and examined side by side with that of the blind child.

The naked-eye changes were as follows :—There was well marked atrophy of the optic nerves and optic tracts, as far as and including the corpora geniculata externa. The most striking difference between the two specimens concerned the posterior part of the optic thalami. In the healthy brain the thalami extended backwards so as to include the whole of the corpora quadrigemina between them, and a line drawn transversely at the posterior limit of the corpora geniculata externa lay behind the posterior pair of quadrigeminal tubercles, whereas in the brain of the blind child such a line passed through the anterior pair of tubercles (*vide* Figs. 1 and 2 in *A. f. O.*) The pulvinar on each side overlying the brachium of the corpora quadrigemina was noticeably shrunken; the sagittal measurement of the optic thalami was shortened by about 10 mm. By reason of this wasting there was considerable alteration in the shape and size of the space between the two thalami. On reaching the anterior edge of the corpora quadrigemina the mesial surfaces of the thalami diverged much more abruptly than usual, and the normally narrow cleft between the middle and 'tween brain was thereby greatly widened. In this fissure the brachia of the corpora quadrigemina, and the corpora geniculata interna, normally almost entirely hidden, lay exposed.

The tractus peduncularis transversus, visible in the healthy brain, could not be distinguished in that of the blind child. The corpora geniculata interna were apparently of normal size. The sulci of the corpora quadrigemina, both median and transverse, were almost obliterated, apparently by flattening of the tubercles. As a result of this the difference in level between the optic thalami and the corpora quadrigemina was exaggerated. The frenulum veli medullaris was imperfectly developed.

No microscopic examination of the brain was made; two plates from photographs of the two specimens are given, and thus comparison of the normal and abnormal can be made.

In those mammals upon which experimental work has been carried out the central changes found after long continued blindness have been fairly constant, and consist of

evident atrophy of the corpora quadrigemina ; the optic thalami undergo little if any alteration. In man, on the other hand, in cases of disease, the optic thalami show very definite change in their posterior part. The statements as to the condition of the corpora quadrigemina in these cases have been somewhat contradictory. Haab failed to find any naked eye change in them in an anophthalmic subject æt. 27. Tomaschewski, examining the brain of a patient blind from early childhood, described atrophy of the optic nerves and tracts and the posterior pair of the quadrigeminal tubercles, but not of the anterior pair or of the optic thalami.

Perlia's specimen apparently shows a very definite atrophy of the optic thalami in their posterior part, and of both pairs of quadrigeminal bodies.

J. B. L.

DAVIS (New York.) The Light-Streak as seen upon the Centre of the Retinal Vessels : due to Reflection, Refraction, or to both. *Archives of Ophthal.* XX. i.

Dr. Davis takes up the cudgels in favour of Loring's explanation of this phenomenon, as opposed to the theory advanced by Van Trigt and supported by no less authorities than Mauthner, Jaeger, and Donders. It may perhaps be as well here to state that Van Trigt believed the light-streak seen upon the retinal vessels to be due (we quote Dr. Davis's words) to "the *reflection* from the anterior surface of the vessel-wall back into the observer's eye of those rays of light from the ophthalmoscopic mirror, which fell directly on the summit of the retinal vessels." Loring, on the other hand, considered that the streak was caused by the "*refraction* of those rays of light falling on the summit of the vessel, penetrating it and the blood column, these being reflected slightly by the posterior wall of the vessel, but chiefly by the underlying tissues back through the vessel and blood-column into the eye of the observer, the refractive action of the

blood-column condensing the light as it passes through it both ways, just as a bi-convex lens, thus causing the light-streak." To prove his theory, Loring performed the following simple experiment. He took two small cylinder-shaped boxes, placing them side by side, and at the bottom of one fixed an ordinary ophthalmoscopic mirror, so as to ensure a reflecting surface, while at the bottom of the other he inserted a non-reflecting surface; then just in front of, and running across these surfaces he fastened a very thin glass tube, one line or thereabouts in diameter; this he filled with a solution of carmine and water. These boxes, with the tube in front of them, were intended to reproduce, from a physical point of view, the relations of retina to retinal vessels in the normal eye, the cylinder which contained the reflecting surface representing a globe with healthy retina, while the non-reflecting surface of the other might be taken as the analogue of the condition produced, *e.g.*, by detachment of the retina, or other injury involving its reflecting power. It is obvious that according to Van Trigt's theory, the state of the retina behind the vessels can have no influence on the presence or absence of the light streak, this being caused, as his explanation has it, by the reflection from the anterior surface of the vessel wall; if, however, we adopt Loring's view, the maintenance of the reflecting property of the structures deep to the vessels, is clearly all-important. Loring's experiment, then, consisted in throwing the light with an ophthalmoscope into these two cylinders just as one throws light through the pupil, and he found that in the case of the cylinder with a reflecting surface there was a light streak on the tube analogous to that seen on the retinal vessels, while in the other, the cylinder with the non-reflecting surface, the streak was absent and its place supplied by a diffuse light equally distributed over the whole diameter of the tube.

This result seemed strong evidence in favour of Loring's opinion, but it was by no means universally accepted as such. Two of the principal objections raised by Donders were: (1) "That the blood cylinder in the vessels of warm-blooded animals is non-transparent;" and (2) "That the light, after passing twice through the blood-column,

and undergoing the numerous reflections and refractions on both sides of the blood corpuscles, must be totally diffuse and unfit to produce an image." The author of the paper which we are now considering, has, with the object of refuting Donders' objections, carried Loring's experiment a step further than when first performed. He took two small cylindrical boxes, arranged just as in the original experiment, but, instead of using a solution of carmine and water, he passed a current of blood from the carotid of a cat through the small transversely-placed tube, and found, on illumination, that the results were, in all particulars, similar to those obtained by Loring when employing a carmine and water solution—*i.e.*, there was a definite light-streak on the tube in front of the reflecting surface, and a diffuse light on the tube in front of the non-reflecting surface. This different effect we are compelled to attribute to the difference in surface behind the two parts of the tube, as, in all other respects, the cylinders were arranged in exactly the same way. If, therefore, we admit the analogy between these observations, and observations on the eye, we are obliged also to admit the truth of Loring's theory, and this becomes still more evident when we remember that in vessels lying on a detached retina—*i.e.*, on a surface which is practically non-reflecting, we do not find a light-streak. The author quotes from Noyes' recent text-book (page 50) two cases which bear strongly on this point, and tend to confirm his view. But, to go still a step further, and to demonstrate the fact that light, which has twice passed through the blood-column of a warm-blooded animal, is not too diffuse, as Donders asserted, to give rise to a definite image, Davis placed the thin tube, through which the column of cat's blood was flowing, under the microscope, using a weak eyepiece and a very weak objective, and here again, he found that there was a distinct light-streak on the surface of the tube, a result similar to that obtained by Becker, in his microscopic investigations with the mesentery of frogs. With this evidence on his side, the writer feels confident that the truth of Loring's explanation of the phenomenon in question has been proved beyond dispute.

N. M. ML.

G. A. BERRY (Edinburgh). **Elements of Ophthalmoscopic Diagnosis.** — *Edinburgh and London: Young & Pentland, 1891.*

This is a small, well-printed volume of eighty pages, for the use of students attending ophthalmic practice. It does not aim, so the author tells us, at introducing any new matter, or even at treating the subject of ophthalmoscopic diagnosis in an exhaustive manner; it does not expound the principle of the ophthalmoscope, and it contains no illustrations of the fundus oculi. It is intended for those who have material for study at hand, and have mastered the initial difficulties. It is, in our opinion, admirably adapted for this purpose, and will be found by the student a most helpful companion in the dark room.

The author wisely insists on the importance of ophthalmoscopic examination even in cases where subjective tests of the acuteness of vision, peripheral vision, etc., would lead one to expect nothing abnormal, for there are pathological conditions which are not accompanied by appreciable visual defects, and which it may, nevertheless, be important to recognise; moreover, normal eyes present a great variety of ophthalmoscopic pictures, and the art of ophthalmoscopy consists as much in recognising physiological variations as in determining the nature of pathological changes, and it is often easier to recognise pathological changes than to feel sure that none such are present. Further, he strongly urges that a *routine* method of examination should be adopted, namely, first by oblique focal illumination; second, by using the mirror alone at some distance from the eye, so as to test the transparency of the media, and at the same time to roughly ascertain the presence or absence of ametropia; thirdly, by the indirect method, interposing the object lens between the mirror and the patient's eye, so as to obtain a wide survey of the fundus; lastly, by the direct method, so as to observe any particular part of the fundus under a higher magnifying power.

Chapter 1 deals with the normal fundus, its physiological varieties, its congenital anomalies, and its ordinary senile changes.

Chapter 2 describes the appearances met with in affections of the retina, optic nerve, and choroid, including those which characterise glaucoma.

Chapter 3 explains the appearances seen with the ophthalmoscope in diseases of the vitreous, crystalline lens, iris, and cornea.

The book is clearly written throughout, and will certainly be most useful to those who use it as the author intends, namely, as a guide to practical work.

G. E. de SCHWEINITZ (Philadelphia). A Case of Neuro-Paralytic Keratitis, with Microscopical Examination of the Diseased Eye. *Archives of Ophthalmol.* XX. 1.

We may pass at once to the consideration of the case reported in this short paper. W. S., a man æt. 58, was in good health till 1863 (possibly 1866), when he suffered from a bubo of the right side, followed shortly afterwards by considerable loss of hair; he denied, however, having had a chancre. Three years later he had an attack of rheumatism, and, at the same time, double iritis; he recovered from this illness, and remained well till March, 1884, when he was again laid up, this time with left hemiplegia, both arm and leg being involved. These symptoms passed off in 12 weeks; but in 1885 he had a second somewhat similar attack, also followed by a rapid recovery. In January, 1888, left facial paralysis was noted, and, at the same time, inflammation of the eye was said to have been present, but the author did not see the patient on this occasion, and no note of the character of the inflammatory attack was made; a few months afterwards he left the hospital without any inflammation of either eye. In January of the next year (1889) the writer made the following note:—"Right—round pupil, light reflex pre-

served, large oval grey optic disc, with dish-like, shallow excavation ; arteries as compared with veins smaller than normal ; spots of pigment on the anterior capsule of the lens indicating the presence of a former iritis. Left—pupil nearly occluded by the former iritis, and preventing any view of the fundus ; no evidence of disease of the cornea."

In March of the same year—*i.e.*, two months after the note above quoted—signs of keratitis in the left eye began to show themselves, and, despite all possible treatment, went on to perforation of the cornea in its lower part, with prolapse of iris, while what remained of the anterior chamber was filled with blood. T. — and complete anæsthesia of cornea and conjunctiva. Simultaneously with, or slightly before the onset of the eye-affection, the patient was found to be suffering from more general nervous symptoms, briefly summed up as follows :—"Atrophic paralysis with degeneration in the left forearm ; paralysis not complete and not atrophic in the entire left leg ; paralysis of the facial nerve and of the motor branches of the fifth nerve, involving some of the sensory fibres, and producing anæsthesia of the left side of the face and of the left eyeball." The globe was removed, hardened in Mueller's fluid, and examined subsequently under the microscope. We give a brief abstract of the result. The portion of prolapsed iris was found to be granulating, and covered with inflammatory and granular pigmented cells ; the corneal necrosis was sharply defined on either side by a limiting line, and beyond this point the cornea was comparatively healthy ; at the periphery, however, the epithelial layer and the conjunctiva were swollen and contained collections of small deeply-stained cells—apparently abscesses in an early stage—which had here and there encroached on the true corneal tissue. In the immediate neighbourhood of Schlemm's canal and in the canal itself there were also numerous small round cells. Iris and ciliary body were both infiltrated with inflammatory cells. The lumen of the small ciliary arterioles was found to be unduly contracted, prominent endothelial plates projecting into the channel, while the muscular middle coat was almost entirely replaced by fibrous tissue (mesarteritis). The choroid, retina, and optic nerve were healthy ; the

ciliary nerves, where they pass through the sclerotic, were also carefully examined, but found normal. The author draws attention to the central necrosis of the cornea with the peripheral secondary keratitis as being of especial interest, inasmuch as it closely resembles the type of disease produced in animals by Senftleben, after division of the trigeminus: the healthy condition of the ciliary nerves is also noteworthy. The paper is concluded by a short reference to the various theories which have been advanced to explain neuro-paralytic keratitis, about which there is still considerable diversity of opinion.

N. M. ML.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, JANUARY 29TH, 1891.

HENRY POWER, M.B., President, in the Chair.

An Unusual Result of Cataract Extraction.—Dr. G. A. Berry read notes of a case in which three epileptiform seizures occurred shortly after an operation for cataract. The patient, a female, æt. 72, had never previously suffered from epilepsy. At the operation some rather fluid vitreous was lost; about twelve hours later, pain caused by severe sub-retinal hæmorrhage supervened. Twenty-four hours after the operation an epileptic fit came on, followed by two more at intervals of about an hour, after which there was no recurrence of the attacks. The eyeball was not excised, and the blood-clot broke down and suppurated. Dr. Berry thought the point of interest in the case was the connection between the intra-ocular hæmorrhage and the epileptiform fits; this he believed to be an intimate one, and offered the following explanation. The pressure in the eyeball, caused by the bleeding, gave rise to irritation of the intra-ocular sensory nerve filaments, resulting first in sickness, and afterwards in a still more marked nerve explosion. He thought it curious, however, that in the numerous cases of glaucoma, in which there are often violent general disturbances, epileptic seizures are not more frequently met with.

Mr. Crichton spoke of a case of intra-ocular hæmorrhage coming on apparently six or eight hours after extraction of cataract, and probably induced by the reduction of tension from gradual leakage of abnormally thin vitreous.

Mr. Eales mentioned a somewhat similar case, in which the vomiting following a general anæsthetic appeared to be the cause of the bleeding.

The President cited an incident in his own experience in which an epileptic seizure occurred in a patient during

the operation for cataract. He was able to complete the section, and then waited till the fit had passed off to finish the operation. The case did well.

On Some Points with Reference to the Connection between Accommodation and Convergence.—Dr. Berry, who read this paper, referred in the first instance to the usual method of testing the latent position of the eyes by occlusion of one eye for a few seconds, both in distant and near fixation; this test he thought in many cases gave sufficiently reliable indications of the necessity for operative treatment. He had been for some time examining cases differently, in the hope of obtaining more accurate results. The apparatus employed consisted of scales, graduated in metre-angles, and a vertically refracting prism, or Maddox's glass rod. He emphasised the fact that the use of the metrical notation for testing the supposed relation between accommodation and convergence necessitates, as a basis for measurement not the whole, but only half of the angle formed between the *actual* direction of the axis of the deviating eye and the direction it should have assumed so as to meet that of the fixing eye on the point fixed. In his investigations he had endeavoured to determine the degree to which the associated action of accommodation and convergence can be dissociated in the interest of binocular vision. This was found to be subject to individual variations, could be increased by practice, and differed for different degrees of accommodation or convergence. The amplitude of relative accommodation or convergence is greatest within the range over which the eyes are usually called upon to exercise their functions—*i.e.*, at the reading distance and beyond it; and agreeably with this the relative positions assumed by the axes of the two eyes, when binocular vision is obstructed, are less governed by an intimate association between accommodation and convergence within such range, than when an unwonted amount of accommodation or convergence is demanded. In fixation for intermediate distances there is a gradual increase of latent deviation.

Measurements showed that there is in most cases a great uniformity in the degree of relative divergence for different distances under similar conditions of refraction. It is

greater in myopia and less in hypermetropia than in emmetropia. Although the non-fixing eye may lag behind the fixing eye, it does not necessarily follow that the convergence lags behind the accommodation; this depends upon the position of the starting point of convergence; in other words, on the anatomical position of rest of the eyes.

Dr. Berry had examined 120 individuals, and found that in emmetropia a large proportion had, for distant fixation, perfect or nearly perfect parallelism; *i.e.*, latent deviation of not more than one-fifth of a metre-angle. In myopia parallelism is less frequent, and degrees of latent divergence or convergence are higher. In hypermetropia parallelism is less frequent than in emmetropia, but latent convergence is more common and more considerable than latent divergence. Although small in number, Dr. Berry thought these results at least suggested that there was no necessarily intimate relation between accommodation and convergence for distance. More striking evidence of this was afforded by testing cases of ametropia with and without correcting lenses, when it was found that there is either no alteration in the latent position, or it is slight, and does not at all correspond to the change produced in the state of the refraction. If an emmetrope be forced to accommodate by looking through concave lenses, the change induced in the latent position of the eyes is not co-extensive with the effort of accommodation excited; but as a rule there is gradual increase in the degree of latent convergence as the accommodative effort is increased. In fixation for objects nearer than the reading distance, the latent deviation is much more nearly expressive of an intimate association between the impulse of accommodation and convergence, than in fixation for greater distances. Dr. Berry exhibited diagrams showing usual and unusual curves of latent deviation, for varying degrees of convergence, expressed in metre-angles and dioptries.

Messrs. Hartridge and Adams Frost interrogated Dr. Berry upon several points in his paper, and spoke of the value of Maddox's rod test in examining for slight latent deviations.

Miur's Nystagmus among the South Wales Colliers.—

Mr. Tatham Thompson, who read this paper, first called attention to the uncertainty existing as to the causation of the disease. The two most commonly accepted causes were: First, persistent strain of ocular muscles, especially in those miners who worked lying on their sides; secondly, insufficient stimulation of retina from imperfect illumination. After referring to the statement so frequently made, that nystagmus only occurred in those engaged in the process of "holing," where the miner lies on his side with the eyes directed obliquely upwards, Mr. Thompson said that in the South Wales district there were special opportunities of judging between these two points of "position" or "illumination." The coal worked there is of two kinds—"house coal" and "steam coal." As a rule, miners engaged in cutting "house coal" worked in their "seams" with very little head room, some "holing," the majority working "long wall." Safety lamps were the exception. On the other hand, the "steam coal" miner had, as a rule, six to eight feet of head room, the seams being thick; no "holing," all "long wall" work, which was done principally standing, but with much poorer illumination, owing to the necessity of using safety lamps. It was pointed out that in the former group there were all the conditions which, according to the supporters of the "ocular muscle strain" theory, should induce nystagmus. As a matter of fact, the disease was extremely rare among the "house coal" workers, except in a few cases where safety lamps were used; whilst it was very frequently met with amongst the "steam coal" miners. Mr. Thompson had collected evidence from colliery surgeons, engineers, managers, and workmen from all parts of the district, and held that the general consensus of opinion pointed emphatically to imperfect illumination being a potent, if not the essential, factor in the causation. Several of the medical men whose opinions he had sought, had been for years in districts where "house coal" had been worked and "holing" practised, but who, until the "striking" of the "steam coal" and the introduction of the safety lamp, had never seen miner's nystagmus. Cases were quoted where those suffering from the disease, on using the safety lamps, had been relieved on going back to work with the

naked light. The absence of nystagmus amongst the "labourers" and "haulyers" was explained by the fact that their occupation was much more varied, as a rule with better illumination, and that much of their work was done by "feel," there being nothing like the necessity for continued strain of vision in semi-darkness.

The symptoms were usually "dazzling," difficulty in fixation, and hemeralopia, but the writer had very rarely found vertigo, vomiting, or inco-ordinate movements of the extremities. In trying to induce nystagmus, attempted fixation of vision in a dark room had been found quite as effective as the oblique upward fixation with the head flexed.

The relation of miner's nystagmus to that induced by corneal and lenticular opacities and congenital deficiencies was considered, and the influence of imperfect stimulation of retina in both cases pointed out. Mr. Tatham Thompson went on to point out that errors of refraction, and especially hypermetropia and hypermetropic astigmatism, were very commonly met with in those suffering from miner's nystagmus; it was exceptional to find it in the emmetrope. He suggested an inquiry in this direction as likely to prove of value. His opinion had been strongly corroborated by the evidence of Mr. G. A. Brown, of Tredegar, who had some years ago found hypermetropia to be a very constant accompaniment of nystagmus. In conclusion, he said: "I would submit that I have brought reasonable evidence to show that visual strain, with insufficient illumination, is, at any rate, as great a factor in the causation as strain of the ocular muscles; that the disease is by no means confined to those whose work is done lying down, and that errors of refraction, especially hypermetropia and hypermetropic astigmatism, are predisposing causes."

Mr. Snell (Sheffield) said that a knowledge of the working of a coal mine was very essential to the proper understanding of miner's nystagmus. He had at different times been put to some trouble by statements which on investigation proved groundless. The reader of the paper did not appear to have proved the correctness of his assertions as to the men's attitudes in the pits he mentioned, by observations made while the men were actually at work. This was to be

regretted, as it was important. Opinions were of no use for the elucidation of the question: facts were required. Mr. Snell referred to his own investigations, extending over many years, during which time he had endeavoured by every possible means to acquire an intimate knowledge of the manner in which miners worked. He estimated that at least five hundred cases of nystagmus had been under his treatment, and he had notes of over one hundred cases. His remarks were based on facts thus obtained. It was impossible to regard imperfect illumination (safety lamp) as the chief factor in causation, because cases occurred in miners using naked lights. He mentioned cases of his own, and referred to the observations of others. The influence could only be secondary. The prime cause lay in the attitude assumed by the miners throwing their heads and eyes obliquely. "Holers" were the class prone to the disorder. They formed only a small proportion of the total workers in a pit, and it seemed to follow naturally that there was something specially prejudicial in their work. He alluded to different facts supporting his contention, and said that the results of treatment were distinctly corroborative. Men over and over again recovered without leaving the pit if they changed their work, but became speedily worse if they returned to their old occupation. He referred to cases like this, and concluded by saying that his later observations were decidedly corroborative of his published ones.

Living and Card Specimens. — Mr. HARTRIDGE: (1) Chronic Glaucoma with Hæmorrhage in the Cup; (2) Models for demonstrating Errors of Refraction. — Mr. WRAY: Binasal Hemianopsia. — Mr. DOYNE: Case of Paralysis of Right Sixth and First Division of Right Fifth Nerves, with Partial Optic Atrophy. — Mr. JULER: Congenital Buphthalmus. — Mr. CRITCHETT: Conical Cornea treated by Cauterisation without Perforation. — Mr. LANG: Absolute Glaucoma with Extensive Retinal Hæmorrhage.

ANIRIDIA AND GLAUCOMA.

BY E. TREACHER COLLINS, F.R.C.S.,

CURATOR OF THE MUSEUM, ROYAL LONDON OPHTHALMIC HOSPITAL,
MOORFIELDS.

The occurrence of primary glaucoma in cases of congenital absence of the iris, either complete or partial, would at first appear to show that closure of the filtration area of the cornea, by the apposition of the root of the iris to its posterior surface, is not an essential factor in the production or in the maintenance of the increased tension, and that the removal of a portion of iris is not the chief cause of its diminution in the operation of iridectomy.

* Mr. Lang has recorded a case of primary glaucoma in a patient with a congenital coloboma of the iris outwards: † Dr. Brailey one of double microphthalmos and glaucoma in a girl aged 18, the iris being absent in her right eye except for a narrow crescentic piece on the inner side which occupied about two-fifths of the circle, and absent in the left except for three small isolated bits, also on the nasal side. ‡ Dr. Armaignac reports a case of glaucoma secondary to dislocation of the lens in a patient with nearly complete aniridia.

To these I am able to add the following one of primary glaucoma, with apparently complete aniridia.

Case I.—Charles E., æt. 34, was admitted to Moorfields Hospital on November 9th, 1889, under the care of

* Trans. of the Ophth. Soc. Vol. x., p. 106. † Ibid., p. 139.

‡ Mémoires et Observations d'Ophtalmologie pratique, p. 239.

Mr. Tay, who has kindly permitted me to publish the case. The patient stated that when a boy at school he had good sight, both for near and distant objects. He was able to read, but could not bear a bright light. His right eye was not then so good as his left. For two years previous to admission he had noticed gradual failure of sight in his left eye, while that of the right, he thought, had somewhat improved. He had worn glasses (+ 6 D., with a stenopaic aperture in the right 3.5 mm. wide) for eighteen months. His parents' eyes were healthy; he had had three children, two of whom (the first and the third) were dead, and both these children, he said, had the same malformation of eyes as himself. The second child, who was alive, had good blue eyes.

Examination showed complete absence of both irides. Some fine granular opacities and a few vacuoles were seen in the right lens. There was deep cupping of the optic nerve in this eye. T. was + 1, V. = $\frac{3}{60}$; \bar{c} + 6 D., and with a stenopaic aperture 3 mm. wide = $\frac{6}{36}$. The nasal and lower parts of the field were much contracted. The left lens was cataractous, presenting an appearance like mother-of-pearl, the triradiate arrangement at the anterior pole being plainly marked. T. was increased. V. = hand reflex only.

On Nov. 18th the cataract was extracted from the left eye, the operation being uncomplicated. Vision with this eye on patient's discharge from the hospital was noted as \bar{c} + 16 D., and a stenopaic aperture 3 mm. wide = $\frac{6}{24}$, and with + 20 D. = J. 4.

In the next case which I record, I have been able to make a pathological examination of the eyeball. I am indebted to Mr. Nettleship for the specimen and the notes of the case. It is one of double congenital aniridia, in which one cornea became ulcerated, the eye subsequently becoming glaucomatous, and a staphyloma forming in the ciliary region. The pathological examination throws light on the way in which the increased

tension was probably brought about in the above-mentioned cases. It shows, in fact, that these cases do not form any exception to the rule that glaucoma is accompanied with blocking of the filtration area of the cornea, and that no new theory need be sought to explain them. In this case the ciliary body ended anteriorly in a rounded, slightly projecting nodule, the rudimentary iris, which, though not sufficiently large to be seen through the cornea, yet, when pushed forwards so as to come in contact with the posterior surface of the latter, was sufficient to block the filtration area. The primary cause of the glaucoma in this case is difficult to determine; possibly it may have been the hæmorrhage into the lymph space between the choroid and sclerotic.

The pathological examination of this eye also shows that the apparent complete congenital absence of the iris, or the presence of a congenital coloboma of the iris, does not diminish the likelihood of relief of tension being obtained by a sclerotomy in the former case, or an iridectomy in the latter.

Case II.—Amelia B., aged 22, a pale, unhealthy-looking girl, was admitted into St. Thomas's Hospital on October 18th, 1889, complaining of pain in her right eye. She had been in the hospital previously in May, 1880, with congenital aniridia in both eyes and a perforating ulcer of her right cornea.

On examination she was found to have ptosis and marked nystagmus. The right eye was congested; there was a central leucoma of the cornea and a staphyloma in the ciliary region down and out. The condition of the cornea prevented examination of the deeper structures; the tension was not noted. In her left eye the cornea was quite clear; the iris was absent, the fundus normal. V. = $\frac{5}{60}$, and letters of J. 16 unimproved with glasses. She was illiterate. She had good teeth, and showed no signs of inherited syphilis.

She stated that her eyes had always been different

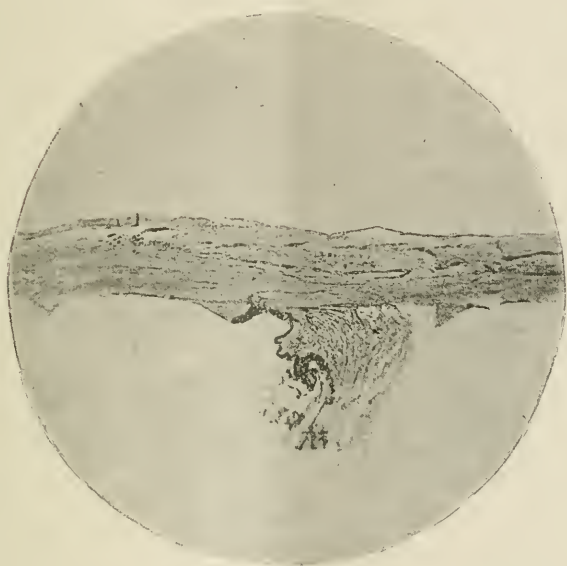
from those of other people. Her father had died from cancer of the stomach ; her mother was alive and well. She had two brothers and one sister alive, and one sister had died aged 31. None of these had anything the matter with their eyes. She had a baby seven months old ; this child was seen, and both irides were absent. Thin opacities were observed in each lens, presenting all the appearances of lamellar cataracts. The margins of the lenses and the fibres of the suspensory ligament could be clearly made out. The child could distinguish light, and otherwise seemed quite healthy ; there was no rash on the skin. The patient's right eye was excised on the day following admission.

Pathological Examination.—The eyeball was opened by an antero-posterior vertical section. The ciliary body, with its processes, was present, though much stretched and atrophied down and out in the region of the staphyloma. It ended anteriorly in a small rounded projection, the sole representative of the iris. The lens appeared small ; it was in its normal position, the suspensory ligament being much stretched. The retina and choroid were detached. There were extensive blood clots between the latter and the sclerotic, extending from the ciliary body to the optic nerve. The optic disc was deeply cupped and excavated.

Microscopical Examination.—The filtration area of the cornea is blocked by the intimate adhesion to it of the rounded nodule in which the ciliary body terminates. This is shown in the accompanying figure, which has been reproduced from a photograph of a section of this eye, kindly taken for me by Mr. E. Collier Green. The ciliary body in this section, as the result of manipulation during the embedding of the specimen, has become somewhat displaced from its connection with the sclerotic.

That it is possible for glaucoma to occur in an eye in which there is traumatic aniridia is shown by the following case. In it the filtration area had become

blocked by the anterior part of the ciliary body, which was drawn forwards and held in contact with the cornea at its periphery by the entangled lens capsule.



Case III.—George P., aged 26, was admitted to Moorfields Hospital under Mr. Tay on January 5th, 1890. He stated that twelve years previously he had wounded his right eye with a chisel, and that since that time he had been unable to see with it. During the last few years it had gradually been increasing in size. The eye being blind and staphylomatous, was excised the following day.

Pathological Examination.—T. was + 2. The antero-posterior diameter measured 29 mm., the vertical 27 mm., and the lateral 25 mm. In the whole circumference of the globe between the margin of the cornea and the insertion of the recti muscles, there was thinning and bulging of the sclerotic, most marked at the upper part. Passing horizontally across the cornea

at about the junction of its lower and middle thirds was a dense white cicatrix with some yellow deposit around it. Adherent to this cicatrix on its inner surface was the lens capsule. The nucleus and greater portion of the cortex of the lens were absent; the iris was entirely absent; the ciliary body was considerably stretched and atrophied; its processes were drawn forwards and elongated. There were extensive patches of choroidal atrophy, with deeply pigmented margins. The vitreous was fluid; the retina *in situ*, except at the ora serrata, where it was slightly drawn forwards. The optic disc was deeply cupped.

Microscopical Examination.—The anterior part of the cornea shows some round-celled infiltration and new vessels between its layers. The iris has been torn away at its extreme root. The ciliary muscle is much atrophied. The most anterior of the ciliary processes is intimately adherent to the posterior surface of the cornea at its periphery, in the region of the ligamentum pectinatum.

NICATI (Marseilles). The Gland of the Aqueous Humour; Gland of the Ciliary Processes; or Uveal Gland. *Arch. d'Ophthal.*, Nov.—Dec., 1890; Jan.—Feb., 1891.

This paper gives an account of a series of researches establishing the existence of a glandular apparatus for the secretion of the aqueous humour, considered from the histological, physiological and pathological standpoints.

After giving a historical outline of our knowledge of the anatomy and physiology of the apparatus for the secretion

of the aqueous, the author gives the result of his own observations, as follows:—

1ST PART.—ANATOMY.

The anterior half of a rabbit's eye hardened in sublimate, with the vitreous and lens removed, is taken. The opaque white retina is observed to stop at the ora serrata, about 2mm. behind the ciliary processes. From this point onwards the pigment is covered by a very delicate membrane, of the same appearance as the retina, but so thin that the pigment is seen through it. This membrane covers the whole surface of the ciliary processes, and extends forwards to the root of the iris. This represents the gland proper, formed of two parts, one extending from the ora serrata to the root of the ciliary processes, and the other, much more important, following the folds of the ciliary processes. It is difficult to measure the extent of this epithelium because of the numerous folds which the microscope brings into view, but if spread out fully, the epithelial or secreting surface of the gland is estimated to cover a surface of six centimetres square. If the eye be hardened in osmic acid and alcohol, and sections cut, the structures can be seen in detail. The transition from the retina to the gland takes place in the following way—The pigment layer continues without any obvious alteration, but the rest of the retina is progressively changed, losing first the rods and cones, with the external granular and intergranular layers, but keeping for some distance two rows of cells. The ganglionic layer seems to be the one most definitely continued on into the cylindrical epithelial layer of the gland.

The gland itself is formed of two layers—the external layer of pigmented cells, the internal layer of cylindrical cells. The former consists of a single layer of more or less flattened prismatic polygonal cells, loaded with pigment, and containing a large oval nucleus; the pigment is massed near their internal surface, and protrudes more or less between the cells of the subjacent layer. The cells of the posterior part of the gland are large and hexagonal, identical, in fact, with the retinal epithelium; the cells of the anterior or ciliary portion are much smaller, and hardly

larger than the non-pigmented cells of the epithelial layer.

The cylindrical cell layer consists of prismatic cells with an oval nucleus, showing on their sides the effect of reciprocal compression ; the striation observed by Schultze could not be made out ; their height is generally greater than their breadth, but they are considerably flattened in certain regions which may be likened to ducts.

Next is considered the attachment of the ciliary processes to the crystalline lens (the cilio-capsular ligament, a vestige of the capsulo-vascular membrane of the embryo).

If a rabbit's eye be opened at the equator, and the vitreous removed from its attachments to the ciliary processes and lens, the latter body nevertheless remains adherent to the processes ; if it be removed, the cilio-capsular ligament will come away with it. The ligament can be entirely detached from the crystalline and spread out on the stage of the microscope ; it will be found to consist of very delicate wavy connective tissue ; rigid fibres of peculiar aspect, the rigid fibres of Henle ; and of blood corpuscles. These blood corpuscles are the remains of the vascular organ which occupies this region before birth, the tunica vasculosa lentis ; they do not appear to be contained in vessels with distinct walls. The suspensory ligament thus formed is found to be entirely independent of the wall of the canal formed by the hyaloid, with which it is often confused under the name zonula ; this distinction is further confirmed by comparative anatomy. In the dog's eye there is seen, in addition, a very delicate membrane covering the epithelium, but attached to it only by fine fibrillary prolongations, which leave an interval for the circulation of the aqueous, which, without prejudice to its nature, is called the external limiting membrane of the ligament.

A description of the blood supply of the gland follows next. The ciliary epithelium rests on a layer of vessels, an expansion of the chorio-capillaris, and its nutrition is found to depend on this membrane as a whole ; the anatomical reasons for this are given here, and they are supported by physiological ones, as will be shown in the physiological section.

The chorio-capillaris consists of a layer of very large capillaries contained between two impermeable walls, the internal vitreous lamina within, the external limiting membrane (intervascular of Sattler) without. If, therefore, serum transudes from the capillaries, it cannot escape through the walls of this sac, but must find its way out in front where, through the disappearance of the vitreous lamina, the sac lies open to the glandular epithelium. For this reason the chorio-capillaris is called the source of the aqueous humour. Sattler, with all other authors, is wrong in attributing to the chorio-capillaris the part of nutrition of the retina.

Muscular fibres are present over the whole extent of the choroid, but are especially developed anteriorly, where they pass into the ciliary muscle. The veins pierce the choroid in a much less oblique manner than the arteries, so that contractions of the choroid have more effect in compressing the veins than the arteries; the result of this compression is, necessarily, venous congestion of the chorio-capillaris.

The secreting channels, the course of the flow of the aqueous to the anterior chambers, and the means of absorption or excretion of the aqueous, are next described. Descemet's membrane is a cuticular layer, absolutely continuous, and allows none of the aqueous fluid to pass through it. The iris, on the other hand, is formed exactly like a sponge. It has on its anterior surface crypts, on the floor of which the epithelial covering presents lacunæ, and there is in addition beneath the epithelium a spongy network communicating eventually with the circumvenous lymphatic spaces, and these latter are finally emptied into the ciliary veins and the venæ vorticosæ.

The anatomical channels for the absorption of the aqueous are then the lymphatic clefts and lacunar spaces of the iris, and the perivenous channels ending in the venæ vorticosæ and the anterior and posterior ciliary veins.

Experimental proof of this has been furnished by Leber, whose method is described, also that of Memorsky. By a modification of the latter method, the result of experiments

on an albino rabbit is given, which confirm the statement given above as to the channel of excretion of the aqueous.

2ND PART.—PHYSIOLOGY.

This part consists of a series of experiments for determining the nature and origin of the aqueous fluid, and the conditions of its secretion.

If the anterior chamber be tapped and the aqueous removed, it does not clot, but if after an interval of ten minutes the newly-formed aqueous be removed, it forms a solid clot which, examined microscopically, is found to consist of a felted mass of fibres identical with those seen in blood clot.

An injection of a weak solution of fluoresceine was made under the skin of a rabbit. After twenty-four hours the injection was repeated; after forty-eight hours, and again after six days, the injection was repeated. There was no colouration of the aqueous after any of the injections. Another injection was made, and after fifteen minutes the anterior chamber was tapped; the fluid withdrawn was not stained, but there soon appeared in the field of the pupil, coming from behind the iris, a current of green fluorescent liquid, heavier than the ordinary aqueous, as it fell to the bottom of the anterior chamber like a hypopyon.

If the dose of fluoresceine was largely increased, the aqueous humour did become spontaneously coloured; it did not clot on being removed, however, and after twenty-four hours the fluoresceine disappeared from the normal aqueous, but was still present in the aqueous resecreted after tapping. The same result was obtained by using ferrocyanide of potassium for an injection and testing for its presence in the aqueous by perchloride of iron.

From these results it is concluded that there are two physiological varieties of aqueous humour; the ordinary non-fibrinous fluid of the first evacuation, and the fibrinous fluid of the second evacuation, a paralytic secretion, as will be shown later.

In cases of occlusion of the pupil after iritis, fluid accumulates in the posterior chamber, and the iris is bulged forwards, yet there is always present in the anterior chamber a small amount of fluid. The adhesion of the iris to the lens, the result of iritis, diminishes the value of these observations, but fortunately an eye was discovered in which there was total occlusion of the pupil by a persistent pupillary membrane, without adhesion to the lens. In this eye the anterior chamber was present, and the posterior chamber was distended so as to occupy half the volume of the much enlarged eye. From this it is concluded that the aqueous humour is secreted to a great extent by the walls of the posterior chamber, but that a perceptible exudation takes place from the walls of the anterior chamber.

One of the eyes of a rabbit which had been injected with fluoresceine or ferrocyanide of potassium was removed and examined; not only was the aqueous unstained, but the walls of the iris and ciliary processes back to the ora serrata were quite unstained. The epithelium covering the ciliary processes was examined microscopically: the spaces between the cells contained the colouring matter, the cells themselves were quite free from it. The formation of an unstained fluid from a stained blood in a tissue loaded with staining matter, the epithelium alone remaining free from colour, can only be attributed to the action of the epithelium.

The formation of a vertical coloured line in the anterior chamber after injections of two grammes of a 20 p. c. solution of fluoresceine is next described. This line, which the author calls Ehrlich's line, occupies the whole length of the vertical diameter of the cornea: it is situated immediately behind the cornea, in the anterior chamber; it is linear over the greater part of its extent, but widens towards its ends, where it rests on the circumference of the iris. This is the usual form of it, but it varies at different times in breadth and intensity of colour, and is occasionally negative, that is, a colourless line separating the two coloured areas. The interpretation of this phenomenon is that there are in the anterior chamber two rotatory currents dividing the chamber into two vertical halves. The question as to the

influence of gravity in forming this line is decided in the negative, because the line can be made to follow all the movements of the eye, even so far as to become horizontal. The author supposes that it is due to an impulse communicated from the arteries in the great arterial circle of the iris. The action of the current is the important one of continually sweeping the posterior surface of the cornea, and of hindering deposits from taking place on it.

The author's observations confirm those of Schoeler and Uthhoff on the effect of section of the sympathetic on spontaneous colouration of the aqueous.

To discover the origin of the fibrinous secretion, injections of fluorescine or ferrocyanide of potassium were made, the aqueous was evacuated, a fresh-coloured aqueous was allowed to be formed, then the eye was enucleated and examined. The anterior and posterior chambers contained coloured fluid, but their walls were not impregnated with colouring matter; the vitreous, lens, and retina proper were unstained; the surface of the ciliary processes and the chorio-capillaris, on the other hand, were strongly coloured; the surface epithelium of the ciliary processes was unstained, but the interstices between the cells were coloured.

The author repeated Deutschmann's experiments, and removed the iris and ciliary body, preventing the subsequent destructive inflammation, which Deutschmann thought was inevitable, by strict antisepsis and suture of the lids. After this operation the aqueous was no longer secreted; its source was found to be definitely exhausted. These experiments prove that the aqueous is secreted from the surface of the glandular epithelium, which extends from the root of the iris to the ora serrata.

It was shown in the anatomical section that the chorio-capillaris was contained in a closed sac, open only to the epithelium of the ciliary processes, and experiment shows that the chorio-capillaris participates, as a whole, in the elaboration of the aqueous fluid. It has been already demonstrated that after injection of fluorescine, and evacuation of the aqueous, the chorio-capillaris alone is stained, the

retina remaining absolutely colourless ; this result is entirely confirmed by the ferrocyanide method. The factors bringing about this secretion, and the nervous phenomena of it, are next considered. After a number of trials it was found that the mean time which elapsed between the evacuation and the appearance of colour in the anterior chamber was three minutes ; the same result was obtained after evacuation of the aqueous by pressure on the eye ; after evacuation of a certain amount of vitreous through a puncture in the equatorial region, there was the same colouration, but it was less intense, and slower to appear. In all these cases secretion was fibrinous. Hence the occurrence of fibrinous secretion is a reflex act consecutive to the lowering of tension in the eye.

Section of the thoracic cord and loss of blood induce slowing of this reflex act, while section of the fifth nerve hastens the occurrence of the reflex. If the section be made in front of the Gasserian ganglion the secretory interval is only one minute ; if behind the ganglion, two minutes : the ganglion, therefore, acts as a moderating centre for the secretion. Section of the medulla at the level of the calamus induces acceleration of the reflex ; section below this level does not induce acceleration. Hence all sections of the fifth nerve hasten the reflex, and hence the fifth nerve is a moderator nerve whose centres for this function are the Gasserian ganglion and the medulla. Further, this action of the fifth nerve is independent of blood pressure ; it is an inhibitory action ; for after total section of the thoracic cord, blood pressure being reduced to a minimum, section of the fifth induces the usual acceleration.

If the action of the fifth nerve is an inhibitory one, its section should be followed by secretion even without puncture of the cornea ; and this is so. The anterior chamber being already full will not easily allow fresh fluid to enter it, but that there is an increase of secretion can be demonstrated by the manometer, by the presence of fibrin in the anterior chamber, and by the colouration of the aqueous by fluorescein. It is further found that by the section of the ciliary nerves secretion is quite stopped ; this can only be due to the action of the lenticular ganglion.

Finally, the cornea is found to be the peripheral starting-point of the reflex; section of the nerves of the cornea brings about results identical with those following section of the fifth nerve in the cranium; anæsthesia of the cornea, brought about by cocain, has no influence on the secretion.

W. T. HOLMES SPICER.

SEGGER (Munich). The Dependence of Myopia on the Form of the Orbit, and the Relation of Staphyloma Posticum to Refraction. *Von Graefe's Archiv., Vol. XXXVI., Part II., p. 1.*

This paper records and analyses a large number of measurements made by the author with the object of testing the alleged dependence of myopia upon a special conformation of the orbit. As is well known, Stilling has attributed the production of myopia in a large class of cases to the effect of muscular action during the period of growth, and especially to the action of the superior oblique. If the trochlea is relatively high above the globe, the tendon of the superior oblique passes steeply downwards, and the combined action of the muscles has little tendency to elongate the globe. If, on the other hand, it is relatively low, the tendon has a longer contact with the globe, and exercises more pressure on it. Hence a comparatively low orbit tends to the causation of myopia during the use of the eyes on near objects. This is Stilling's theory (see "Transactions of Internat. Ophth. Congress, 1888," p. 97), and he has found, as the result of many measurements, that a relation between myopia and a low orbit actually exists.

Segger's observations differ in certain respects from those of Stilling. He measured with compasses the aperture of 1900 orbits, taking for the vertical diameter the middle points of the upper and lower margins of the orbit, and, for

the horizontal diameter, the point corresponding with the insertion of the internal palpebral ligament. The refraction was accurately determined in every instance, and when staphyloma posticum was present, its form and size were noted. Myopia was present in 1152 of the eyes; the remainder were hypermetropic or emmetropic. The results are exhibited numerically in a series of tables, and are summed up as follows:—

1. The height of the orbit is greater in the adult male than in the adult female, but not much greater, the difference on the average being only 0.7 mm. In childhood the relative heights are reversed.

2. The breadth of the orbit is considerably greater in the adult male than in the adult female, namely, on the average, 1.449 mm., *i.e.*, twice as much as the difference in the height. The orbits of nine and ten year-old myopes are very low—on the average 2 mm. lower than those of emmetropes, and 3 mm. lower than those of hypermetropes of the same age. The myopes of this time of life are chiefly boys, and seeing that, as already stated, boys' orbits are, as a rule, lower than girls, this fact indicates a causal relation between a low orbit and myopia.

3. The difference in the height of the orbit, between myopes on the one hand and emmetropes on the other, is reversed during the period of growth, for adult myopes have, as a rule, the highest orbits, adult hypermetropes the lowest. The difference between the myopes and the emmetropes is, on the average, 0.362 mm.; that between the myopes and the hypermetropes is only 1.076 mm. This increment during the period in question is, therefore, greatest in myopes, least in hypermetropes. The average increment is: for myopes, 5.410 mm.; for emmetropes, 2.972 mm.; for hypermetropes, 1.5 mm.

4. The breadth of the orbit increases equally at first in all three classes of refraction. The increment is smaller than that in the height of the orbit in both sexes up to the age of puberty; after puberty it continues to be smaller in females, while in males the increase in the breadth of the orbit preponderates over that in the height.

5. Since the increase in the height of the orbit during

the period of growth is different in myopes and non-myopes, it must be connected with the causation of myopia. The low orbits of youthful myopes support the supposition that the production of myopia is connected with excessive pressure on the part of the superior oblique. The remarkable increase in the height of the orbit in myopes may be explained by the increasing size and prominence of the myopic eye. The hypermetropic eye is smaller and deeper seated; the emmetropic is intermediate in these respects between the other two. In some myopes the orbital aperture remains low; in such cases the orbital roof may be elevated and the eye remain more deeply seated than usual.

6. The hereditary transmission of myopia depends upon a low orbit.

Although he thus lays stress on the conformation of the orbit as a factor in the production of myopia, Seggel expressly declares that it is not an essential or the only cause; it is merely a condition which frequently and strongly predisposes to myopia at a relatively early age.

In the second portion of his paper the author tabulates his observations concerning the production of staphyloma posticum (conus), or the myopic crescent. The following are his conclusions:—

1. The crescent is formed by extension at the posterior pole; yet, as Stilling has proved by anatomical evidence, it is to a large extent merely the result of the altered and oblique perspective in which the scleral ring presents itself to view. Stretching and atrophy of the choroid with thinning of the sclera occur only when the attachments of the nerve-sheath are very firm. With these occur sclero-choroiditis and more or less lowering of visual acuteness and of light-perception; the comparatively uncommon occurrence of loss of acuteness with a sharply defined crescent is caused by the pull upon the nerve fibres, especially those which supply the macula.

2. The crescent is exceptional in emmetropia and hypermetropia; it is the rule in myopia and typical of this condition. A crescent in an emmetropic or a hypermetropic

eye is a certain sign that the eye has previously been hypermetropic or highly hypermetropic respectively. In such eyes, under unfavourable circumstances, acuteness and light-perception may suffer as in myopia. The so-called myopic process may occur, therefore, in emmetropic and hypermetropic eyes.

3. The crescent is not only typical of myopia, but its size is more or less directly related to the degree of the myopia. If the size of the crescent is disproportionate to the degree of the myopia, and especially if in high myopia the crescent is absent or small, the myopia is dependent on congenital error of curvature, aggravated in the latter case by excessive use of the eyes.

4. Between the widely spread and innocent work-myopia (*Arbeitsmyopie*) and the very rare hydrophthalmic form there are very numerous transition forms, and these latter forbid the assumption that myopia is merely the expression of an innocent process of deformation and that elaborate hygienic precautions are superfluous.

5. Ring staphyloma is, as a rule, a farther development of the simple crescent concurrent with increase of the myopia; it is therefore the typical sign of a myopia which, through excess of near work, has reached a high degree, and which involves damage to the function of the eye.

P. S.

ALLEMAN. Galvanism in the Treatment of Corneal Opacities. *Brooklyn Medical Journal*, Nov. and Dec., 1890.

The frequency of permanent opacities of the cornea in the community at large is taken as some measure of the importance of any method of treatment that can in general be applied with benefit. As such a method, is brought forward the application of galvanic electricity directly to the surface of the cornea. The paper includes the reports of ten cases, of from six weeks' to twenty years' duration, all treated with considerable benefit. To record the progress

of some of these cases photography was resorted to, but proved quite unsatisfactory on account of the reflections from the surface of the cornea. Reliance had to be placed on the acuteness of vision to demonstrate the improvement brought about.

To insure accuracy of the tests of visual acuteness artificial illumination of unvarying brilliancy was employed, the distances were accurately measured, and the test-letters used were frequently changed to prevent the patient from remembering them. [This last precaution, however, might have introduced an element of error, in that different letters of the alphabet, or even slightly modified forms of the same letter, though of the same size, differ greatly in visibility.—ED.]

The improvement recorded is in each case decidedly greater than any inaccuracy of observation will account for. In one case of eighteen years' duration the vision rose, by ten applications in three months, from $\frac{2}{200}$ to $\frac{20}{200}$. In another of equal duration from $\frac{1}{100}$ to $\frac{2}{40}$ by sixteen applications, extending over a period of six months. In one in which the duration of opacity was seven months, it rose from $\frac{2}{200}$ to $\frac{2}{40}$ by seven applications in twenty-two days. And in one of two months' duration the treatment, extended over a year, and including thirty-six applications, brought vision up from $\frac{2}{200}$ to $\frac{2}{40}$.

Alleman was led to make trial of this method of treatment by the reports of the usefulness of electricity in promoting the absorption of repair tissue in other situations. Reasoning on the subject, he concluded that a small electrode applied to the surface of the cornea was indicated, since by this means a current of great density would be applied directly to the diseased point, and since the greatest molecular activity is induced at the point directly in contact with the electrode, the indication of limiting the current's action would be best fulfilled.

The other and larger electrode is applied to the cheek just below the eye, making the path of least resistance through the soft tissues of the face, rather than through the deeper portions of the globe and the intracranial portions of the nervous system.

The electrode recommended consists of a silver bar, 12 mm. long, insulated, except at the ends, by a shell of hard rubber. The distal end is 7 mm. in diameter, and slightly concave. The other end is connected with a handle by a spiral spring of copper wire, which protects the cornea from injury by movement of the electrode, and allows of adjustment to the angle most convenient in the individual case. In this application of electricity some form of galvanometer is essential. The current employed produces no sensation at all in the anæsthetised cornea, so that the patient cannot tell whether it is passing : and even if a battery of ensured constancy could be obtained, the variations of resistance of different patients, or of the same patient at different times, is so great that it is impossible to judge even approximately of the current used. For the proper control of the current it is also necessary to introduce in the circuit a delicate rheostat.

In making the application the cornea is rendered anæsthetic with cocaine. The strength of current may be adjusted by passing it through the patient's tongue, which offers practically the same resistance as the eye. The cathode is applied to the cornea. Before application the extremity of the corneal electrode is dipped in mercury, and a globule adheres to it. This was originally resorted to with the idea of getting the benefit of a mercurial application ; but whether it has any medicinal effect or not, it is a means of obtaining very perfect contact of the electrode with the cornea without undue pressure or risk of abrasion.

The strength of current that can be safely employed varies greatly. Alleman begins with the application of $\frac{1}{4}$ to $\frac{1}{2}$ milliampère, continued for one minute, and gradually increases the time to three or four minutes. The strength of the current may also be slightly increased at each application. The strongest current he has employed is one of 4 m.a., continued for three minutes, but such an application will be borne only in exceptional cases, and he thinks that one of 1 to $1\frac{1}{4}$ m. a. will give the best results. Even with this latter strength considerable irritation at the anode may be experienced by thin-skinned people. Marked vesication of the cheek has been produced without setting

up any disturbance of the cornea. The limit of strength in any case is placed at that which causes slight irritation, which subsides entirely before the next application, usually made after the interval of one day.

The passage of the current is seen to cause dilatation of the pupil. But, as a rule, no light sensations are observed by the patient at the making or breaking of the circuit. This latter fact seems to indicate that the current does not in any considerable strength penetrate the deeper structures of the eye. E. J.

KNAPP (New York). A Case of Tuberculosis of the Conjunctiva, with Remarks. *Arch. of Ophthal.*, Vol. XIX., No. 1.

BURNETT (Washington). Tuberculosis of the Conjunctiva. *Archiv. of Ophthal.*, Vol. XIX., No. 2.

Knapp's case, which occurred in a boy of nineteen, gave a history of three or four years' standing, with treatment for trachoma. The nasal orifices presented scars, especially on the septum, said to mark the site of chronic ulceration cured four years ago by "cutting and cauterisation." He had hoarseness due to congestion, swelling and small ulcers of the mucous membrane of the larynx. Both lids of the left eye were thickened near the inner canthus, and there were two ulcers on the conjunctival surface of the upper lid. The invaded tissue showed greyish nodules tending to break down on the surface. The mucous membrane of both lids was swollen, dark red, and here and there beset with greyish-red granules. The involved tissue at the inner extremities of the lids and the sides and floors of the ulcers were excised, and the isolated granules touched with the galvano-cautery. The eye continued comfortable, without relapse, three months and a half later.

The surface secretion and sections of the excised tissue showed a moderate number of tubercle bacilli; and the

latter, the general histological character of tubercular tissue. Pieces of the excised tissue placed in the eyes of rabbits caused the destruction of three out of four eyes inoculated, by tubercular disease, and one of the rabbits which died exhibited a few tubercles beneath the visceral pleura.

Burnett's case was in a coloured boy of fifteen, and also of three or four years' standing. Both eyes were involved. The right cornea hidden by upper lid, both lids adherent to the globe. The right cornea vascular and hazy. The conjunctiva in both was thickened and granular, with defects of surface. Eighteen months later there was symblepharon of both eyes, incomplete of the right, and the condition of conjunctiva much the same. The skin and margins of the lids remained quite normal. Scrapings of the surface and the excised conjunctival tissue showed many bacilli, and the histological characters of tubercle.

Burnett also gives a case seen in 1885, which, though lacking in the microscopical evidence of the process, he regards as tubercular. The nodules have since completely disappeared, but not without almost total destruction of vision. Both writers regard lupus as identical with chronic tuberculosis, and Burnett gives a considerable bibliography of the subject, including papers on lupus. He also agrees that, if the situation and extent of the disease permit it without destruction of vision, the proper treatment is complete excision. Both papers are illustrated by lithographic plates.

E. J.

BARABASHEFF (Charkov). On Quinine Amaurosis.
Vestnik Ophthalmol., Jan.—Feb., 1891.

This paper is a reprint of a communication made by the author to the medical section of the Society for Experimental Sciences at Charkov. The object of the investigation was to study the effect of overdoses of quinine in perfectly healthy people. For this purpose Barabasheff obtained the

co-operation of some of his colleagues, who allowed themselves to be experimented on. He also experimented on rabbits and dogs.

Of six individuals, who took from 40 to 60 grains of quinine, three presented very definite symptoms; the remaining three were unaffected, but it was considered too risky to administer larger doses to these, as the symptoms in two of the cases in which poisoning took place, were sufficiently alarming. The salt used was the muriate of quinine.

The value of these experiments consists in the certainty that all the observed changes were produced purely by quinine, and were not due to the coexistence of any disease.

Barabasheff divides the symptoms of poisoning, as he met with them, into two categories, the first of which are already known, while the second have not previously been observed, and therefore call for confirmation.

To the first category belong the following symptoms :—

(1.) Acute gastritis, resulting from the local action of large doses of quinine on the gastric mucous membrane.

(2.) Pallor of the face and conjunctiva, giddiness, sometimes fainting, drowsiness, ringing in the ears, ischæmia of the retina.

(3.) Marked contraction of the retinal vessels, and pallor of the disc.

(4.) Diminution of visual acuity, sometimes amaurosis.

(5.) Concentric restriction of the field of vision.

The symptoms referred to the second category are :—

(1.) Temporary increase of visual acuity (lasting some hours).

(2.) Contraction of pupil, lasting only a short time, and followed by moderate dilatation.

(3.) At first quickening and afterwards slowing of the pulse.

(4.) Increase of sensibility in the skin, occurring after some time, and followed still later by a diminution of sensibility.

(5.) Slight increase of temperature ($0.2 - 0.4$ C.).

This is less marked the larger the dose taken. The author explains that in order to observe the changes which

he has referred to the second category, it is necessary to examine the individual soon after the quinine has been taken.

Complete amaurosis only occurred in one of his cases, and lasted a very short time. Its character and the fact that it was accompanied by palpitation of the heart were sufficient evidence that it was due to an abnormal state of the vascular system. Restriction of the field of vision occurred in two cases ; it preceded the complete amaurosis in the one case, and in the other it varied greatly from time to time, sometimes increasing, sometimes diminishing, but leaving central vision normal. In this case, too, there were attacks of palpitation. The author did not observe any diminution of corneal sensibility, any red spot at the macula, or any colour-blindness, all of which conditions have been described by others in cases of quinine poisoning. Marked ischæmia of the retina occurred in all cases, and in two the pallor of the disc completely resembled that found in optic atrophy.

The symptoms caused by overdoses of quinine are therefore, in all probability, according to Barabasheff, due to poisoning of the vaso-motor centres, tending to excessive constriction of the peripheral vessels. The continuance of the vascular constriction he considers, with Horner, to be due to local changes which are set up (*endovasculitis ex ischæmia*).

GEO. A. BERRY.

FAGE (Bordeaux).—Pseudo-membranous Conjunctivitis.—*Arch. d Ophthal*, Jan.-Feb., 1891.

This short paper is a record of a case of conjunctivitis with formation of membrane, in which the author sought by careful bacteriological investigations to solve the problem of the identity or non-identity of this form of disease and true diphtheritic conjunctivitis. The condition described by von Graefe* as diphtheria of the conjunctiva, in his experi-

* *Arch. f. Ophth.* 1854.

ence, of fairly frequent occurrence in North Germany, is, according to Fage, very rarely met with in France. In the latter country a membranous conjunctivitis, first described in 1846 by Bouisson, occurs ; but it is considered by most authors as not really diphtheritic. There are well-marked differences in the appearances of the two forms, and in their relative malignity. In that described by von Graefe, the cornea generally suffers and is often partially destroyed ; in the other form serious corneal complications are seldom met with, and although a definite false membrane is found on the palpebral conjunctiva, this usually disappears without leaving permanent signs in the shape of cicatrices.

The question has arisen, however, as to whether the two forms are not identical in origin, and differ only in degree. It seems probable from the researches of Venneman, that diphtheria is not the only affection capable of exciting a conjunctival inflammation which is accompanied by fibrinous deposit on its surface, and it is of some importance to be able to distinguish between true conjunctival diphtheria and fibrinous inflammations, in the causation of which Loeffler's micro-organisms play no part. If it be accepted that all inflammations of conjunctiva or other similar tissues, with membranous formation, in which Loeffler's bacillus cannot be discovered, are not truly diphtheritic, then the microscopic diagnosis becomes an easy but important matter.

Fage's patient was a sickly child æt. 15 months, who came under observation on June 28th. The eye trouble began on the 24th, and when brought to the Hospital there was moderate swelling with redness of the lids, which were nevertheless supple and easily everted. The upper palpebral conjunctiva on each side was covered by a grey false membrane, fairly thick, adherent to but separable from the mucous membrane ; the removal of this layer exposed a raspberry-like bleeding surface. Both corneæ were infiltrated, especially in the central part. The membrane was thickest, and the corneal affection most advanced in the right eye.

No membrane could be discovered in the fauces ; a few large mucous *râles* could be heard in the chest.

The local treatment adopted consisted of a sublimate

lotion 1:2000, iodoform ointment and atropine; tonics were also administered.

Improvement soon took place, and by July 6th all membrane had disappeared. Ulceration of the right cornea occurred and hypopyon formed, but after paracentesis the ulcer healed and no recurrence of the hypopyon was noted.

In the tubes of gelatine inoculated from the membrane and kept at a temperature of 37° C, colonies were visible on the second day. These were of two varieties, one opaque and white, the other greyish. Microscopic examination showed two kinds of micro-cocci; and these were easily isolated by Esmarch's method: one variety proved to be streptococcus pyogenes; the other staphylococcus pyogenes albus. No species of bacillus was found in any of the cultures. Three tubes of serum were inoculated with *débris* of the false membrane, when the disease was nearly at an end; these remained sterile.

The author considers that these results established the non-diphtheritic nature of his case, and is of opinion that a correct diagnosis in doubtful cases can be made only by ascertaining the presence or absence of the bacillus (Loeffler) generally considered as characteristic of diphtheria. The appearances of the lids and conjunctiva, and the nature and distribution of the false membrane, are, he thinks, insufficient guides.

J. B. L.

B. GEPNER, JR. (Warsaw). Hyaline New Growth on the Lens Capsule and Descemet's Membrane. *V. Graefe's Archiv.* XXXVI., 4.

The first case referred to in this article is one of capsular cataract in a fish (a tench), which had been under the writer's observation for about three years. During this time he noticed that the pupils gradually lost their clear black appearance, and became, instead, first grey and then

almost white, until finally the lens opacity which was forming, presented the definite characters of anterior polar cataract. While the author was attending the ophthalmological department at Heidelberg, he was able carefully to examine the eyes of this fish, and he has reported the result of his investigation in the present paper.

Microscopic Examination —Sections were cut vertically, and both eyes were found to show similar changes. Under a low power there was seen a rounded cellular swelling at the anterior pole of the lens, situated immediately under the capsule, and separated behind from the lens epithelium by a thin homogeneous membrane, in structure closely resembling the capsule; it looked, in fact, as if the growth were enclosed within two capsular layers. The lens epithelium, under the newly-formed tissue, was disturbed and irregularly thickened, but gradually resumed its normal character until, at a point 1 mm. or so from the swelling, its single layer of cells became again visible. A few cortical striæ were noted in the lens substance towards the anterior surface.

Under a higher power the structure of the growth was seen to be more complicated. Numerous delicate processes, homogeneous, and apparently exactly resembling the membrane interposed between the new growth and the lens epithelium, were seen to stretch across it, and although, for the most part, parallel to this membrane, were yet branched and subdivided enough to form a rough network, in the meshes of which many cells were embedded. The nuclei of these cells were mostly oval; their length much exceeded their height, and they looked, the author says, as if they had been squeezed together by a force pressing from back to front, not from side to side. Preparations coloured with hæmatoxylin showed that these parallel processes, and the posterior lining membrane above referred to, took a deeper stain than the capsule. At the point where the membrane and the capsule joined, and for some little distance beyond, the two structures could be distinguished, not only by the difference in depth of staining, but also by a sharply defined line marking their place of junction; this posterior membrane was thickest towards the periphery, and very thin at the centre, while the lens capsule also varied in thickness, and had dis-

tinged lines running on it. About 1 mm. distant from the edge of the swelling was a second small elevation composed of irregularly placed cells.

This description corresponds closely to that of capsular cataract as observed in man, but the point of interest lies, the author thinks, in the origin of the internal lining membrane. He has no doubt that both the parallel processes in the substance of the cataract, and the posterior membrane are derived from the same source, and cannot agree with Becker's suggestion that the membrane is a layer split off from the capsule; were this the case, each set of parallel fibres would also represent a fine separated layer of capsule. He thinks it more likely that these structures are the result of an exudative process from the thickened lens epithelium, and that they have assumed their parallel arrangement by being separated from the lens as a series of fine membranous layers which have become covered with cells and pushed forwards, as each new layer was successively detached: he lays special stress on the fact that the growth has been, in his opinion, entirely from behind forwards, and believes that this explains the compressed appearance of the cells, more particularly in the anterior part of the cataract.

The second case referred to in this paper is one of rupture of Descemet's membrane and subsequent complete healing by the interposition, between the two lips of the wound, of a bridge of tissue identical in structure with the membrane itself. This, the author believes, is the first instance of the kind which has been reported. The case occurred in a man, æt. 21, on whom iridectomy had been performed for iritis, and who several years later received a blow on his right (lost) eye, which became inflamed, and was, in consequence, excised. The microscope showed an interruption in the even line of Descemet's membrane, there being two small processes projecting from it forwards into the cornea (these evidently corresponding to the torn ends), while the gap was filled by a layer of tissue which joined the bases of the projecting processes, and corresponded in structure to the original membrane. Two excellent plates illustrate the article.

N. M. ML.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, MARCH 12TH, 1891.

HENRY POWER, F.R.C.S., President, in the Chair.

The Glands of the Ciliary Body in the Human Eye.—Mr. Treacher Collins, who read this paper, first reviewed briefly the evidence obtained experimentally by Deutschmann, Schœler, Uhthoff, Leplat, and Nicati as to the secretion of the aqueous humour and the nutrient fluids of the vitreous. These experiments all tended to prove that these fluids were secreted by the ciliary body. The difficulties in the histological examination of this structure are mainly due to the large amount of pigment present therein, whereby the exact characters and arrangement of the cells are obscured. Mr. Collins described a method of bleaching which he had employed, and by the aid of which he was enabled to obtain sections of the ciliary region of the human eye almost free from pigment. From the examination of sections thus treated, he found that the uveal pigment layer from the root of the iris to the ora serrata was composed of a single row of somewhat flattened cells, projecting from the outer surface of which were numerous processes each composed of a group of cells. These were largest and most numerous at the junction of the plicated and non-plicated parts of the ciliary body, where they were pear-shaped. In transverse sections each projecting group could be seen to be tubular, with a small central lumen. These tubular processes, he thought, could be nothing else than secreting glands concerned in the elaboration of the aqueous humour and nutrient fluids of the vitreous.

The disease originally described by Wardrop as *aquocapsulitis*, and now generally termed *serous iritis*, he regarded as primarily a catarrhal inflammation of these glands. The whole course of the disease, he thought, pointed in this direction, and the histological appearances of eyes lost from it were quite in keeping with this view—there being some increase in the size of the glands, some irregularity in the proliferation of their epithelium, enlargement of the blood vessels in their vicinity, and a variable amount of round-celled infiltration about them. When inflammation of the ciliary body of a more plastic character occurred, there was considerable overgrowth of its uveal pigment layer, in which overgrowth the cells were arranged in the form of cylindrical tubes just like tubular glands. He mentioned a case of tumour of the ciliary body described by Alt, which he regarded as an adenoma, and a second case of tumour in the same region, which he considered to be a glandular carcinoma.

In conclusion, Mr. Collins said he claimed that there were, in the region which experiment had proved to be the part of the eye from which the aqueous and nutrient fluid of the vitreous are secreted, numerous minute tubular processes of epithelial cells, which can be nothing else than glands concerned in the elaboration of these fluids, and that, like secreting glands elsewhere, these glands are liable to attacks of catarrhal inflammation, which give rise to the group of symptoms generally described as serous iritis. These glands may also be the seat of tumours which may belong to the adenomata or glandular carcinomata. The histological points referred to in his paper were afterwards illustrated by lantern slides made from photographs of microscopical sections.

The President thought Mr. Collins's paper was one of very great interest, and showed that there were parts of the eye which would still repay careful investigation ; he thought such an investigation as that reported might lead to an increase in our knowledge of glaucoma.

Mr. Priestley Smith referred to the early descriptions of the ciliary body, and stated that Mackenzie, as long ago as 1835, gave an account of its functions which had since

been confirmed by experiment. He suggested the advisability of using the term serous cyclitis instead of serous iritis.

Mr. Jessop drew attention to the difference in the character of the fluid obtained from the anterior chamber by a first and subsequent tapping, that obtained by the second tapping containing more proteid material.

Mr. Collins, in reply, said that he had examined a large number of glaucomatous eyes in reference to ciliary body changes, and had found no obvious alteration in the glands described, except in cases of long standing, in which they shared in the atrophy of the ciliary body.

Hydrophthalmos.—Mr. F. R. Cross (Bristol) read a paper on this subject, in which he first referred to the descriptions by writers of fifty years ago, and commented upon the gradual development of knowledge of the disease. In recent text-books but little attention is given to hydrophthalmos. Some authors deal with the condition as only congenital, while others deal with it as a variety of secondary glaucoma. Excess of intraocular pressure produces some expansion in any healthy sclerotic coat, but the maximum of expansion is soon reached. During the growth of the eyeball, and to some extent up to early adult life, continuous high intraocular pressure is accompanied by distension and thinning of the fibrous coats, with stretching and modification of the uveal tract and retina, while in later years, after senile and retrogressive changes have occurred, the sclera resists a high degree of intraocular pressure for months, without progressive distension (Priestley Smith). Glaucoma before the age of 30 is rare, and before the age of 20 extremely so. A few cases have been published, several in eyes distinctly microphthalmic, and others in which the corneal measurement has been found to be below the normal standard (11 to 12 millimetres, Priestley Smith). On the other hand hydrophthalmos almost always begins, whatever be its cause, in childhood. It may begin in early adult life, while the tissues of the eye are still extensile. It never commences in middle life, but when it is protracted to this period the symptoms tend towards the glaucomatous type. Anything which causes excess of blood in the eye,

venous or arterial, or imperfect lymphatic outflow, tends to raise the intraocular pressure, and such conditions produce in the adult eye glaucoma, in the youthful eye hydrophthalmos. Dufour regards the condition as one of primary glaucoma, and he accounts for the open filtration angle and deep anterior chamber by weakening of the zonule of Zinn, and yielding of the corneo-scleral ring, thus allowing of easy passage of the intraocular fluids, and an equal pressure in both aqueous and vitreous chambers. The author considers that the cases apparently congenital in origin may depend upon error in development, or upon intrauterine inflammation, but thinks that in some the morbid condition really begins after birth, or may be a true primary glaucoma during childhood, and that undoubtedly many which can only be classed as hydrophthalmos are genuine cases of secondary glaucoma, traumatic or otherwise. Several observers have described the microscopical characters found in buphthalmos, but the author believes that the pathological changes are probably as much the result of intraocular pressure as its cause. The primary seat of inflammation seems to be in the ciliary body, at the base of the iris, with implication of the limbus corneæ and the filtration channels. Weakness of the zonule, distension of the lens capsule, and lenticular trouble might also easily arise, with modification of the intraocular fluids and interference with their proper transudation. Dürer and Schlegtendal, in a recent account of the microscopical examination of five eyes affected with congenital hydrophthalmos so-called, drew special attention to the condition of the uveal tract. In all these cases the choroid and ciliary bodies were found markedly atrophied; the venæ verticosæ were extremely narrowed in their passage through the sclerotic, while their tributaries in the suprachoroidea were dilated and varicose. In some of the cases dilatation of the large veins and atrophy of the tissues alone existed, whilst in the others there was distinct evidence of inflammation, especially in the region of the posterior aqueous chamber. Increased vascularity and round-celled infiltration were found in the corneo-scleral margin. Schlemm's canal, Fontana's spaces, and the anterior ciliary veins were usually narrowed or obliterated.

The term "buphthalmos" should only be applied to cases in which the prominent cornea is surrounded by a thinned blue-tinged sclera, while the term "megalophthalmos" might be retained for cases in which the hypertrophied staring eye is otherwise normal. The history of the case will determine when it should properly be called congenital. Mr. Cross read histories of two cases of hydrophthalmos one associated with a high degree of myopia, the other dependent on blockage of the filtration angle by a dislocated lens; and of five cases of buphthalmos (the exaggerated form of hydrophthalmos), one probably congenital, one commencing in early life, and three secondary to *iris bombé*, or perforating wounds of the cornea.

Dr. Argyll Robertson said that under the heading of Mr. Cross's paper were included cases which differed markedly in some particulars, although they had in common the distension of the anterior parts of the eyeball. He mentioned a family under his care in which the mother and three children were affected by hydrophthalmos; in one child the disease was unilateral.

Card Specimens.—Mr. Lang: Hunterian Chancre on Ocular Conjunctiva.—Mr. Tweedy: Result of Operation for Ectropion of Lower Lid following Burn.

A. WAGENMANN (Heidelberg). Experiments upon the influence of the Retinal and Choroidal Vessels on the Nutrition of the Eye, more especially on that of the Retina, and the Results of Section of the Optic Nerve.—*V. Graefe's Archiv.* XXXVI. iv., p. 1.

The author gives a short *résumé* of the results of experiments undertaken by others, among whom may be noted the following observers :—

Rosow divided the optic nerve in the rabbit, and produced a gradual atrophy of the retinal nerve fibres (medullary fibres), the central vessels being intact.

W. Krause divided the optic nerve in the dog, and produced atrophy of the nerve fibres and ganglion cells, without other ophthalmoscopic changes.

Berlin divided the optic nerve and central vessels in the frog, producing retinal anæmia and diffused haze of the retina ; and, although the circulation re-established itself in three weeks, atrophy of nerve fibres and ganglion cells, with pigmentary degeneration of the retina, resulted. A similar proceeding in the rabbit produced similar results, the retinal vessels also becoming atrophic, and in some cases the choroidea too being affected. Some of his results are probably due to section of the ciliary nerves, as corneal anæsthesia and opacity and phthisis bulbi were frequently observed.

Krenchel divided the optic nerve intracranially in the frog, and found the retina normal for as long as six months after the section.

K

Leber divided the nerve and central vessels in the rabbit, and observed the immediate contraction of the vessels and gradual restoration of circulation. He had similar results in the cat. Atrophy of the nerve fibres was seen in from two to four weeks after the section. He observed the cloudy retina (as in embolism) which Berlin had also noted, and he concluded from these and other observations that the choroidal circulation shares in the work of retinal nutrition.

Knies has concluded, principally on clinical grounds, that the choroidal vessels supply the nutrition of the external retinal layers, pigment epithelium, rods and cones, limitans externa, and external nuclear layer; while the retinal vessels supply the internal layers, nerve fibres, and ganglion cells, the intervening layers getting supplies from both sources.

Russi tied the optic nerve in the rabbit, and produced retinal anæmia, followed by congestion, papillitis, and white atrophy with pigmentary changes.

Poncet performed optico-ciliary neurotomy in animals, and found results similar in all essentials to those of Russi. In men, phthisis bulbi resulted.

Marckwort experimented on the dog. After dividing all nerves and vessels except the optic nerve and the central vessels, pressure on the nerve produced an opacity in the papilla, which spread along the vessels to the retina, and was due to a serous effusion. Tying or dividing the nerve produced results similar to those of Berlin and Russi. Division of the nerve alone, without cutting the vessels, led to a slow atrophy of the nerve fibres.

Hamburger divided the nerve of the frog intracranially, and found, as Krenchel did, no changes in the retina. The pigment cells, too, acted normally to the influences of light and darkness.

The general result of these experiments is that nearly all observers have found a gradual atrophy of the nerve fibres after section of the nerve behind the point of entrance of the central vessels, but their results differ considerably when the section is made closer to the eyeball. Leber, for instance, finds no constant retinal opacity, while Berlin never misses it. The time, too, varies greatly at which

atrophy becomes visible ophthalmoscopically in the rabbit, and it is uncertain whether or not simple division of the nerve and central vessels causes pigment changes. Anatomically, too, differences exist. Markwort found advanced atrophy in fourteen days in dogs, while Berlin found only partial atrophy in rabbits, chiefly restricted to the inner retinal layers, the rods and cones being intact.

Wagenmann's earlier experiments on dogs and rabbits produced no very constant changes, except that in all cases when retinal opacity followed section of the nerve the choroidal vessels could not be fully injected *post mortem*. His later experiments have been on the rabbit, and for purposes of control he has in every case made a *post-mortem* injection of the vessels from the carotid.

In order to study the influence of the choroidea upon the retinal nutrition, he divides a single ciliary artery. The results are, on the whole, the following: No change in pupil, or in sensitiveness or transparency of the cornea. Ophthalmoscopically also at first no change, but in the course of half-an-hour a greyish-white opacity shows itself in the periphery of the fundus, which rapidly spreads through all that portion of the retina lying over the region of the choroidea supplied by the divided artery. The opacity lies in the retina, not in the vitreous. It becomes whiter in the course of time, attains its maximum in about six hours, and remains unaltered for a day or two. As it clears off it assumes a reticulated appearance, and small pigment spots become visible. These pigment spots increase in number and size, and the fundus assumes a yellower hue, over which the retina can be seen as a delicate white veil. The papilla and the retinal vessels remain unchanged, but the pigmentation described above increases up to the third or fourth week, when the appearances simulate those seen after choroido-retinitis, with partial pigmentary atrophy and aggregations of pigment, and apparent occlusion of choroidal vessels. After about a month the affected portion of the retina begins to atrophy (*viz.*, the medullary nerve fibres), and the retinal vessels become smaller, but these atrophic changes are not extensive. In one rabbit, atrophy and retraction of one-third of the iris

occurred, with development of cortical and posterior polar cataract, no doubt due to interference with the circulation of the iris and ciliary body. In albino rabbits the changes are still more interesting. Anæmia of the affected portion of the choroidea at once shows itself, with blood stasis and interruption of the blood column. Retinal opacity comes on after some hours, but is hard to observe. The circulation begins to re-establish itself by the third day, and the anæmic region contracts, though some vessels remain permanently empty. If an injection is made within a day or two after the section, it does not enter the affected vessels. They are either found quite empty or containing a little blood. A few red and white blood corpuscles are present in the tissue, the retina is opaque, thickened, and presents some folds. Microscopically, the opacity is seen to be finely granular. The choroidea, too, is finely granular, and the retina is friable. After the third day an injection can enter the vessels at the edge of the bloodless district, and later on it reaches more and more vessels, but some remain permanently occluded. The retinal vessels are always free. The vessels of the corresponding portion of the iris and ciliary body are at first more or less occluded, but the collateral circulation establishes itself very rapidly in this region.

The changes in the retina are most marked in the bacillary and the outer nuclear layers. They consist in an effusion of an albuminous fluid, with molecular haziness and swelling of the tissue elements. The rods and cones are separated from each other, raised up from the limitans, and pushed about in all directions. Similar changes take place in the nuclear layer. An amorphous albuminous effusion lies between the bacillary layer and the pigment epithelium, and fills up the grooves between the folds in the retina. Degeneration of the pigment epithelium occurs early, and changes like those in the outer layers (but less marked) are seen from the very first in all the inner retinal layers. These appearances are restricted to the portion of retina connected with the anæmic choroid. The rest of the retina is normal. The degeneration of the retina is found to progress rapidly, except in those places where the

re-establishment of choroidal circulation restores its nutrition, until the tissue consists of only a thin fibrous layer, containing round pigment cells and no retinal elements. The nerve fibre layer suffers least of all, but does not escape. The retinal vessels remain normal. Slight fibrous degeneration occurs in the vitreous. The cornea commonly remains normal, but changes in the epithelium and localised opacity are sometimes observed. Fibrinous opacities are seen in the aqueous during the early stages. In addition to the anæmia, the ciliary body and iris exhibit slight serous effusion, and diapedesis of red and white blood corpuscles. The lens fibres and their nuclei, and the cells of the anterior capsule exhibit slight changes, an increase of albuminous material being present, which in two cases produced a rupture of the lens capsule at the posterior pole when it was placed in hardening fluid. These changes are no longer observable at a late period, the normal condition being restored. In one rabbit, as mentioned earlier, cataract developed, and the microscopical appearances in this lens lend support to the theory advocated by Schirmer and Wagenmann, that the substance of the lens capsule is a product of the capsular epithelium.

It is not always possible to avoid in these experiments the division of one vortex vein. This, however, has no effect upon the subsequent intra-ocular changes, and division of two vortex veins on the same side (without dividing a ciliary artery) causes neither retinal opacity nor pigmentary changes.

Division of both long ciliary arteries, with some of the short ones, leads to phthisis bulbi. Opacities develop so rapidly in cornea, aqueous, and vitreous, that ophthalmoscopy becomes soon impossible. Changes, however, similar to those seen when one ciliary artery is divided are visible in the retina for some hours after the section, and they are much exaggerated. The corneal opacity is clinically and microscopically so exactly like that seen in diffused interstitial keratitis that Wagenmann throws out the suggestion that parenchymatous keratitis may be merely a secondary result of a choroidal affection. The centre of the cornea may ulcerate, but generally the cornea recovers its transparency

after undergoing a vascularisation, as in the well-known diffused interstitial inflammation. The eyes that recover after the section remain plithisical, and their recovery seems due to development of collateral circulation from scleral, muscular, and conjunctival vessels. The microscopical appearances in the cornea are those of diffused interstitial keratitis, and agree with those observed by Leber after injection of aspergillus spores into the anterior chamber.

The corneal inflammation is always of the same type—fibrinous infiltration, incursion of lymph cells, development of blood vessels, and with them regeneration. The anterior chamber fills with fibrinous and albuminous exudations, red and white blood corpuscles, and finally becomes occluded, though it may subsequently become partially re-established.

The vitreous shrinks rapidly, and finally is represented merely by a thin layer of fibrous tissue attached to the posterior lens capsule, and containing a few cells and some free pigment. The changes in the other tissues are extensive and similar to what one would expect *a priori*.

Division of the optic nerve alone, behind the point of entrance of the central vessels, produces gradual atrophy of the medullary nerve fibres alone, the vessels remaining normal, and the disc being deeply excavated. If such an eye be examined after six months, the nerve fibre layer is found perfectly atrophic, the ganglionic layer imperfectly so, and all the other layers normal, except that the bacillary layer is in places displaced from the limitans externa, and that Müller's fibres are hypertrophied. The central end of the optic nerve shows ascending degeneration.

Division of the optic nerve and central vessels produces immediate anæmia of the papilla and retina, but neither then nor subsequently any opacity of the retina. The colour of the fundus remains unchanged, except that pretty often, just above the papilla, one wedge-shaped piece of retinal opacity appears. This is due to occlusion of the subjacent choroidal vessels, their blood supply being cut off in the manipulation necessary in dividing the nerve so close to the globe. The retinal circulation may become partially re-established in these cases, or remain permanently completely absent.

The atrophy of the medullary nerve fibres is not hastened by the division of the central vessels, nor does it occur more quickly in the cases which never recover their retinal blood supply than in those where the circulation becomes re-established.

Wagenmann also obtains permanent destruction of the retinal blood supply by cauterising the stump of the optic nerve after section. This operation is followed by an opacity in the papilla and surrounding retina, which runs the usual course described previously, and is due to the damage done to the choroidal circulation. The re-establishment of the retinal circulation, which occurs to a partial degree in most cases, seems to be the result of the formation of new blood vessels, which spring partly from the choroidal ring, partly from the nerve sheath and the episcleral tissue, and partly from the ciliary vessels. All these pass into the papilla, and anastomose with the old retinal vessels. The histological appearances resemble those seen after simple section of the nerve without dividing the central vessels, except that more extensive changes occur in the burnt region.

From these experiments it is probable that the central vessels have little or no share in the retinal nutrition. A further series was undertaken, in which, after dividing the nerve and central vessels (with or without burning), Wagenmann also divided one or more ciliary arteries on one side. The subsequent ophthalmoscopic appearances are a combination of both those previously described. The opacity remains longest in the band of medullary fibres, and, as it clears, rapid atrophy comes on, which is well marked within 10 or 14 days of the operation; while the opposite side shows no retinal atrophy after so long as three weeks. Of course, the retinal vessels are obliterated on both sides.

These experiments show that the choroidal circulation is the important agent in retinal nutrition, but that the central vessels alone are sufficient to prevent complete destruction of the retina after section of one or more ciliary arteries. Division of optic nerve and all retinal and ciliary arteries leads to necrosis of the cornea and suppuration of the globe.

Wagenmann sums up the results of his experiments on the rabbit as follows:—

(1) Division of the optic nerve alone causes at first no ophthalmoscopic changes, but leads to gradual atrophy of the nerve fibres, and also, to a lesser extent, of the ganglion cells, the retinal circulation remaining normal.

(2) Division of nerve and central vessels produces immediate retinal anæmia, which is followed by gradual but incomplete restoration of circulation. Division of the central artery causes no opacity in the retina, and does not hasten the atrophy which follows section of the nerve alone.

(3) Unilateral section of long and short posterior ciliary arteries produces rapid degeneration of all the retinal layers on that side, the first sign being a grey-white opacity in the affected retina. The nerve fibre layer suffers least, and the restoration of choroidal circulation prevents the destruction of the retina on the affected side from being complete. Pigmentary deposits occur in the atrophic retina.

(4) Division of optic nerve and central vessels, combined with section of ciliary vessels on one side only, leads to rapid degeneration of the nerve fibre layer on that side, as well as the ordinary retinal atrophy on both sides.

(5) Division of the optic nerve and all retinal and ciliary vessels leads to rapid destruction of the whole retina.

These observations agree with some of those of former observers, notably with those of Leber and Rosow, but are at variance with others, above all with those of Berlin. It is probable, however, that Berlin must have usually divided most of the ciliary arteries with the nerve, judging both from his method of operating and from the phthisis bulbi which followed. In the six cases where phthisis did not follow, he only divided a few of the ciliary vessels, enough to produce the retinal opacity and the atrophy and pigmentary changes he observed. The phthisis bulbi Wagenmann attributes entirely to the section of the ciliary vessels, and not in any wise to the division of ciliary nerves. In Marckwort's experiments on the dog, too, the ciliary vessels must have suffered, or the pigment epithelium would not have been affected as it was in his cases.

A certain reserve must be shown in forming conclusions

from these experiments upon rabbits as to the nutrition of the human retina. It is known that retinal opacity is seen in embolism of the central artery, but Wagenmann attributes this to the fact of the central vein being free in embolism, while in his experiments it was always divided along with the artery, and also points out that the character and course of the opacity in embolism are very different from what he observes after section of a ciliary artery. It seems to be merely a transitory œdema of the nerve fibre layer. He has failed as yet to divide the central artery of the rabbit without injuring the vein, and has also failed to cause embolism. It is in harmony with his observations that embolism does not cause a pigmentary degeneration of the human retina. Of the cases of embolism which have been anatomically examined, Schweigger's was too far decomposed for certain conclusions to be drawn from it; Sichel's had the same fault; Priestley Smith's lacked necessary details; Nettleship's merely showed œdema of retina in one case, and atrophy extending to rods and cones in the other, and Schmidt Rimpler's differed in its clinical features from the typical form. In it irido-choroiditis came on shortly after the embolism, and it is probable that embolic processes had occurred in the ciliary as well as in the retinal arteries, which would account for the extensive retinal atrophy and pigmentary changes which were present.

In Popp's case, three years after a clinically typical embolism, no embolus was discovered *post mortem*, but the nerve fibre and ganglionic layers were atrophic, the other retinal layers being normal. In the case, too, of Loring and Delafield the nerve fibre layer alone was atrophied, the bacillary layer not well preserved.

In Hirschberg's case, examined six months after the embolism, the nerve fibre and ganglionic layers were absent, the internuclear layer œdematous, and the bacillary layer normal. No embolus was found.

In Schnabel's case of incomplete embolus, too, the nerve fibre and ganglionic cells were absent, and all the other layers normal except the inner nuclear layer, which was slightly thinned.

The material is somewhat scanty, but we may conclude

from these cases that embolism of the central artery does not directly injure any layers beyond the nerve fibres and ganglion cells, and never produces complete pigmentary degeneration of the retina.

The cases recorded of injury to the optic nerve behind the point of entrance of the central vessels are quite in harmony with Wagenmann's observations, as also are those in which both nerve and central vessels were injured. The latter are especially interesting. Pagenstecher's case, where an iron splinter divided the nerve, cannot have been one of simple injury to the nerve and central vessels, as from the nature of the injury, the hæmorrhage and the suppuration, we may be certain that ciliary vessels were also affected, and this will account for the changes in the fundus, which resembled those observed by Wagenmann after dividing the nerve and some ciliary vessels at the same time. The changes also observed in Pagenstecher's second case, when the nerve was divided in extirpating a tumour, are to be referred to the division of ciliary arteries. Just's case throws no light upon the subject, and the same may be said of the cases published by Schweigger, v. Graefe, and Knapp. Knapp's second case, however, is very instructive. In it a tumour was excised from the optic nerve sheath, with division of the nerve close to the globe and of most of the posterior ciliary arteries. On the second day a yellowish-white reflex was seen in the fundus, which became universal next day. On the fourth day the centre of the fundus was still hazy, while the periphery was red. The retinal vessels were at first empty, but gradually refilled, and the haziness gradually cleared up from the periphery towards the centre, until on the fifteenth day the haziness was gone. Five months later there was complete atrophy of the choroidea on the nasal side (the operation wound lay between the int. and sup. rectus), but only as far as the macula on the temporal side, and there was extensive pigmentary degeneration in the affected region. These appearances are exactly what Wagenmann has observed in his similar operations on the rabbit, and demonstrate that pigmentary degeneration of the retina is caused by interference with the choroidal circulation. The case recorded by Schliephake, where the point of

a billiard cue produced similar results, is also in harmony with Wagenmann's experiments, and the only point on which doubt exists is whether division of both central vessels at once, will produce in man a haziness of the retina the same as is seen in embolism. In the rabbit the haze is only produced by interference with the choroidal blood supply.

J. B. S.

J. P. NUEL (Liège). An Ophthalmoscopic Appearance in Myopia, and its connection with the Hereditary Predisposition. *Archives d'Ophtal.* Jan.—Feb., 1891, p. 56.

The author has carefully studied, in a large number of cases, the displacements of the retinal vessels which are found in high myopia, and draws attention to certain peculiarities of this kind which, though they have been seen and figured by many previous observers, have not, he thinks, been so fully considered as they deserve.

In the normal eye the main retinal trunks usually bifurcate on the disc, and form two groups or bundles, the general direction of which is upwards and downwards. In many cases of high myopia the following peculiarities are observable:—The vessels bifurcate, in almost all cases, behind their points of emergence from the surface of the disc. Instead of passing directly upwards and downwards, they tend, even in crossing the disc, outwards towards the temporal region of the retina, and on reaching the retina send their chief branches in this same direction; in extreme cases they present the appearance of two bundles of vessels passing almost horizontally outwards towards the temporal region,

instead of vertically upwards and downwards. On the disc itself the vessels lie against the prominent temporal portion of the disc which forms the margin of a so-called physiological excavation extending to the temporal border. In an immense majority of cases the temporal border of the disc is embraced by a so-called atrophic crescent. The vessels have, on the whole, a straighter course than in the normal eye, and this is especially true of the small vessels, which pass directly outwards from the centre of the disc across the excavated portion towards the macula.

These characteristic changes are well illustrated in the paper before us by a series of drawings. They find a satisfactory explanation in the distention of the sclera at the posterior pole of the eye. The sclera stretches in this region more easily than do the other membranes, and hence it happens that as posterior staphyloma develops, the choroid and retina are dragged backwards and displaced over the surface of the sclera towards and into the ectatic area. At the temporal margin of the disc they part more or less completely from the nerve, and the myopic crescent is the result.

This displacement is, of course, well known, but hitherto attention seems to have been chiefly given to the changes which are produced in the line extending from the disc to the macula, for here the fixed resistance of the nerve and its vessels involves very obvious extension, while the much greater excursions made by the more movable parts of the retina above and below the disc have been less noticed. Travelling around the disc as a centre, like the hand of a watch on its pivot, the vertical meridian of the retina in this region may execute, in course of time, an angular movement of nearly 60 degrees, and may ultimately become almost horizontal. While the temporal portion of the disc becomes excavated in consequence of the traction on the fibres in the direction of the macula, the nasal border becomes raised and partly covered over by the accumulation of the adjacent part of the retina.

The absence of such displacements in some cases of very high myopia is to be explained, the author thinks, by supposing that in such instances the ectasia is more con-

centric with the disc than usual, and that the traction on the retina and choroid is therefore more equal all round the disc. In such cases the lateral displacement of the vessels is absent, and the usual atrophic crescent is represented by an atrophic ring. In one single case the author saw a displacement of the vessels obliquely towards the nasal region, and supposes that the maximum stretching of the sclera had, in this exceptional case, occurred on the inner side of the disc.

A very similar displacement of the vessels through dislocation of the retina is to be seen in some cases of congenital coloboma, and is in such cases itself congenital.

The idea suggested itself to the author that this ophthalmoscopic appearance might perhaps be discoverable in eyes which have a congenital predisposition to myopia but which are not yet myopic. Ectasia at the posterior pole is, of course, not synonymous with myopia. We may conceive the process of distension as beginning early in the growth of the eye while the refraction is still hypermetropic, and if at this early stage it should already cause the characteristic displacement of the vessels, this latter would be an important indication of a tendency to high myopia, for, be it observed, in adult life it is only to be found in very high myopia. So much for theoretical possibility.

Nuel has attempted to solve this question by examining a series of myopes in whom there was good reason to suspect a congenital predisposition. He assumed such predisposition in all cases of very high myopia in illiterate persons, provided no exceptional cause, such as dislocation of the lens, choroiditis, etc., were present. He assumed it also in highly myopic persons whose relatives were similarly affected. For the complete elucidation of the matter it would obviously be necessary to examine a large number of children belonging to myopic families, and to re-examine them periodically over a considerable number of years. Nuel has begun such a research.

Already he is in a position to assert that the displacement in question is sometimes to be found in very young children who are not yet myopic, and at 8 and 9 years of age in children who have not more than one dioptré

of myopia. Hence, while he admits that this characteristic appearance may certainly be acquired during the life of the individual, he asserts that it is sometimes to be found at birth or in early infancy, and that in such cases it is an important indication, being a sign that the eye is destined to become highly myopic, for in adult life it is never to be found in eyes which are not highly myopic.

The idea contained in this paper is obviously important, and it is one concerning which other observers might easily and advantageously contribute evidence.

P. S.

DE BECK (Cincinnati). Persistent Remains of the
Fœtal Hyaloid Artery. With twelve Plates.
American Ophthalmological Monographs. No. 16.

The series of which this is the initial number is intended to be one of elaborate and thorough monographs, properly illustrated. It is an attempt to present to the profession a class of essays which, though of great interest and value, it is often difficult or impossible to get published. They are too extended for the medical journals, even for those devoted especially to ophthalmology; and such monographs published singly obtain so small a circulation as to make them very expensive. Published thus in series, a much wider circulation may be expected.

De Beck has collected here brief but quite complete accounts of this anomaly, and closely allied conditions in nearly two hundred eyes. This includes over twenty that have been seen by himself, and a considerable number from the experience of other observers that have not hitherto been

reported. An account is given of the points in the development of the eye bearing on the occurrence of the anomaly, and a full bibliography is appended. Anatomical data as to persistent hyaloid remains are very scanty. The bulk of observations are clinical, and these De Beck arranges in twelve groups.

Groups A and B include cases in which shreds or membranes of connective tissue are attached to and obscure parts of the optic disc and vessels, group A including the smaller shreds, and B the larger membranous masses. Not a great many of these have heretofore been reported, probably because they are readily overlooked, and when noticed might be regarded as not worthy of record. That they are quite common seems proved by the considerable number observed by single observers. No valid explanation of these conditions has been advanced, and they must be regarded as remains of the funnel-shaped extremity of the canal of Cloquet, flattened down as it would be after the absorption of other portions of the canal.

Group C includes cystic remains. These are rounded or oval, of a pearly grey, or bluish translucent tint. Some seem to be small cysts on the surface of the disc, that would hardly be regarded as remains of the hyaloid, if others did not make a continuous series up to the characteristic hyaloid remains, terminating in such a cyst-like body. Cases of this kind must frequently remain unreported. The reviewer has seen three such, while he has seen but one of the class here collected in Group E, which embraces the largest number of cases heretofore reported.

Group D, irregular clumps of tissue upon the disc, includes forms intermediate to those of the preceding groups, and others that are with doubtful propriety included as hyaloid remains at all.

Group E, including the greatest number of reported cases, embraces those that present a strand of tissue arising from the central artery, or one of its branches upon the disc, once (Mooren's case) from a branch outside the disc, and passing forward to terminate in a free extremity floating in the vitreous. These strands are of various length, may divide, and terminate in knob-like swellings, in fine fibrillæ,

or in a delicate tapering point. If delicate, such remains are certain to be overlooked in the indirect method of ophthalmoscopic examination, and may not be noticed by the direct method. De Beck believes that such delicate strands must be quite common, since he has encountered six of them.

It is not unlikely that the publication of this monograph will draw attention to them, and cause many more to be reported.

Group F differs from the preceding group in having a vestige of the hyaloid upon or attached to the posterior pole of the lens, in addition to the strand attached to the disc. The cases collected in it illustrate the fact that the hyaloid may be broken or disappear at various distances from the back of the lens. In one case the separation occurred on account of stretching by progressive myopia.

Group G contains the cases in which the remnant extends from the disc to the lens. This may be regarded as the typical form, and contains, next to group E, the largest number of recorded cases.

Group H is made to include those few cases which otherwise would be placed in group G, but in which the persistent vessel contained blood. In three of these cases the hyaloid artery was seen with the ophthalmoscope to ramify, the branches passing out toward the periphery of the lens. In three others, examined microscopically, it terminated in minute capillaries invisible with the ophthalmoscope or to the naked eye; and in the other two this latter termination must be assumed. This group would have been very much increased in size had it been made to include all the cases of blood-bearing vessels that have been called persistent hyaloid. But the larger number of these have been cases in which the vessel passed forward a variable distance into the vitreous, and then returned upon itself to be distributed to the disc or retina, or to disappear in the disc. But De Beck argues that it is manifestly erroneous to so include them; that they have no genetic claim here, and that they must be regarded merely as anomalous branches of the *arteria centralis retinae*.

Group I includes the few cases in which the only vestige

was a filament attached to the posterior pole of the lens and floating back in the vitreous.

Group J, posterior polar and capsular cataracts, are, of course, quite common. De Beck calls them polar when they lie within the lens, usually having rounded projections separated from one another by angles of 120 degrees ; and when they lie upon the outside of the lens on the capsule he calls them posterior capsular opacities. Although this is a direct reversal of the use of the terms made by Stellwag, it is sufficiently supported by its analogy to the use of "polar" and "capsular" as applied to anterior opacities.

In Group K are brought together six cases in which the only vestiges of the foetal vessels were a few white or grey radiating striæ on the posterior capsule of the lens. There are, however, included in the other groups, cases in which such striæ were seen in connection with other varieties of the anomaly ; and their close conformity to the usual distribution of the branches of the hyaloid is thought to establish their right to be here included.

In Group L are the cases regarded as examples of the persistence of Cloquet's canal, which has been described as a delicate membranous tubular sheath passing from the disc to the lens, by some regarded as belonging to the vitreous as a special lining of the passage through it for the vessels, and by others as simply the outer vascular sheath. De Beck inclines toward the former view. In this group the anomaly was in almost all instances presented by both eyes.

The clinical aspect of these cases is of minor importance. Many suffer no inconvenience. Some complain of floating shadows. But whatever impairment of vision there is from this condition is scarcely capable of remedy. Secondary pathological changes are very rare. This is considered rather remarkable, considering the number of cases in which the vitreous is whipped by a freely movable strand of firmer tissue. Against the view that many of these cases are in reality pathological in their origin, exudates into the vitreous taking the path of least resistance along the canal of Cloquet, are urged the similiarity of the appearances found, the comparatively slight impairment of visual acute-

ness, and especially the frequency of other well-recognised anomalies in these eyes that present persistent hyaloid remains. Such additional anomalies occur in about half the cases.

Of the plates, ten are coloured. They are not of the finest quality; but they fairly represent the appearances under discussion in forty-two different eyes, and constitute a collection that will be of interest and value to every scientific ophthalmologist.

E. J.

BOÉ (Paris). Further Researches concerning the Treatment to be adopted in Suppurative Panophthalmitis. *Annales d'Oculistique*, Jan.—Feb., 1891.

At the International Medical Congress last year Boé read a paper, founded upon experimental pathology and bacteriology, in which he urged the inexpediency of enucleating a suppurating eyeball. In the paper now before us, he recounts some further investigations which, he considers, strengthen the opinions he expressed at Berlin.

In his early experiments Boé injected blood, taken from a body dead for some days, into the vitreous of rabbits; this was followed by suppurative panophthalmitis, more or less rapid in its development, and death. The majority of the cases in which enucleation was performed did not terminate fatally. When the animals succumbed, the lesions found post-mortem were slight, and consisted generally of white lines, bordered by a reddish zone, on the surface of the liver; microscopic examination showed dilated capillaries plugged with streptococci. There

was no appreciable meningitis, and no metastatic abscesses were discovered. In one of his more recent experiments, conducted on the same lines, purulent pleuritis ensued, and death occurred five days after inoculation. In another in which the same decomposed blood was injected, but in larger quantity, acute suppuration was excited, but on the third day the symptoms began to subside, and eventually the eye presented a nearly normal appearance, though the pupil was completely occluded. The rabbit recovered, and remained perfectly healthy. These two experiments are evidence that the same poison may give rise to either purely local lesions or general infection ; this difference, the author thinks, depends less upon the characters or numbers of the noxious germs, or the nature of the soil upon which they are implanted, than upon the rapidity with which a barrier is formed to prevent them entering the general system.

In rabbits the streptococcus has been shown to be the germ against which precaution is necessary. In man it is probable that other microbes, *e.g.* staphylococcus and pneumococcus, may be nearly, if not quite, as dangerous ; these latter, however, are, without much doubt, only exceptionally the cause of panophthalmitis.

Wagenmann has recorded a case of double metastatic panophthalmitis in a puerperal woman, in which streptococci were found in the retina and vitreous.

Although it has not been shown that the streptococcus is the only or chief agent in all intraocular suppurations, it is impossible to diagnose in any given instance whether or no the inflammation is microbic in origin, and therefore Boé considers the case should be treated as if it were manifest that the eyeball was full of streptococci.

The author is strongly opposed to operating upon suppurating eyes by enucleation or evisceration, and advises that a free incision be made into the eyeball and the purulent contents evacuated. This step, however, he would not take till the pain has become intolerable. Both enucleation and evisceration open up numerous paths along which microbes may enter the system, and Boé found in his experiments upon rabbits that general infection was more

likely to occur if the eyeball was excised *soon* after suppuration was established. Delay in operating lessened the danger, and for this fact two explanations are suggested : either the activity of the micro-organisms diminished, or the occurrence of thrombosis in the veins and lymph channels opposed their entrance to the general circulation.

J. B. L.

BOUCHERON (Paris). The Nerves of the Anterior Hemisphere of the Eye. *Reprinted from Bulletins de la Société Française d'Ophthalmol.* May, 1890.

In a paper read recently before the Ophthalmological Society of France, Dr. Boucheron describes the anatomical arrangement of the nerves of the anterior hemisphere of the eye. He first briefly recalls the fact that after optico-ciliary neurectomy sensibility returns at the circumference of the cornea, which he attributes to the presence of superficial ciliary nerves rather than to regeneration of the deep ciliary nerves. The object of the present communication is to prove the presence of superficial ciliary nerves, and so establish an anatomical and physiological reason for this return of corneal sensibility. The investigations have been carried out upon the eye of the guinea-pig, which most nearly resembles the human eye, and the gold method, slightly modified, was used to demonstrate the presence of the nerves.

1. *The Superficial Ciliary Nerves*.—These nerves, arising from the orbital branches of the ophthalmic nerve near the base of the orbit, form a series of trunks, which divide into one or two large branches and many branchlets. These are (*a*) *the superficial ciliary nerve proper*, one of whose branches is the "large perforating nerve," which, in company with

the anterior ciliary vessels, passes through a funnel-shaped hole in the sclerotic coat and anastomoses with filaments of the deep ciliary nerves to form the "*interciliary scleral plexus*," or "*annular plexus*"; (b) branches forming an "*episcleral plexus*," which sends perforating filaments into the sclerotic coat, to join the middle and chief corneal nerves; (c) a few filaments which go direct to the cornea.

Thus it comes about that the superficial ciliary nerve, by its proper branch and its perforating branchlets, forms an intrasclerous and interciliary plexus with the deep ciliary nerves. In good preparations, where all the nerves were found in one section, there was no difficulty in recognising that the superficial ciliary nerve united especially with the peripheral and intermediate corneo-scleral plexus; hence it innervates almost entirely the intermediate and peripheral zones of the cornea. The conjunctival nerves arise from the trunk or the branches of the superficial ciliary nerve by fine filaments which emerge near the sclerotic, or by branchlets detached from the nerve trunk in proximity to the orbit.

2. *The Tendino-Sclerous Nerves*.—The sensory muscle nerve, when it comes to the tendon, gives off non-medullated branches, which pierce the sclerotic and join the intrasclerous plexus.

3. *The External Ciliary Nerves*.—When these are present, they arise from the intra-orbital sensory nerves and anastomose with the epi- and intra-sclerous plexuses.

4. Certain "*retrograde*" nerve branches, which form external and posterior anastomoses between the deep and superficial ciliary nerves.

The second part of the paper is devoted to a description of the nerves of the pectinated space. These nerves arise from (a) branches of the nerve of the iris as it passes into the ciliary process; they form an irregular plexus on the vault of this space with fibres which course along the pillars. (b) branches of the interciliary plexus; these furnish on the floor of the space an anastomatic plexus with lozenge-shaped meshes, and on the pillars, branches between the plexuses of the roof and the floor. The method of distribution of the nerve-fibres upon the pillars of the pectinated space is worthy of attention. The first row usually receives

straight fibres, the second and third spiral fibres. The author gives to the spiral fibres the special name "*Corpuscle of tension*," having its analogue in the tactile corpuscles of the conjunctiva. Both straight and spiral fibres are fixed to a resistant body—the pillar—so that if the tension of the aqueous humour increases, they at once undergo pressure from the counter-pressure of this subjacent resistant body. The author, therefore, attributes to the *nervi pectinati* and their plexus the function of regulators of the ocular tension, being in fact the chief regulator. The rôle of accessory regulator is played by the corneal nerve fibres, situated near Descemet's membrane, to which fibres Kölliker had attributed the whole of this function.

W. ALDREN TURNER.

OLIVER (Philadelphia.) A Case of Intracranial Tumour, with Localising Eye Symptoms; Autopsy.—*Archives of Ophthalm.*, Jan., 1891.

In February, 1890, Oliver saw, in consultation, a man, *æt.* 39, who had suffered for two years from vertigo, headache, and attacks of momentary blindness. The case has been recorded in a paper read before the American Neurological Society, by the physician in attendance. Oliver's account deals almost entirely with the eye symptoms, and of the other symptoms it may be merely stated that they consisted chiefly of motor disturbances on the *right* side.

The ocular symptoms were as follows:—Vision in each eye was reduced to $\frac{5}{10}$ with correcting lenses (refraction myopic); colour vision for red and green was slightly lowered, especially on the left side; there was right lateral hemianopsia, with contraction of the remaining half of each field, more marked on the left side; in that portion of

the field for green which remained there were "feebly negative scotomata, more pronounced in the left eye;" pupils equal, and both active to light, but the left iris was less brisk than the right; hemiopic pupillary reaction was "plainly manifest;" the extra ocular muscles appeared normal, with the exception of slight weakness of convergence. On ophthalmoscopic examination, in addition to characteristic myopic fundus changes, there were, in the *right* eye, enlargement and tortuosity of retinal arteries and veins, and a large hæmorrhage covering the lower outer quadrant of the disc, not evidently connected with any particular vessel.

These ocular conditions, the author considered, pointed to a "gross left-sided intracranial lesion, so placed as to cause the greatest pressure upon the left optic tract, between the corpora quadrigemina and the chiasma, a few of the contiguous crossing fibres of the right side being also irritated, and somewhat pressed upon;" the general symptoms indicated that the greatest effect of the lesion was felt in the region of the left pulvinar.

At the *post-mortem* examination the left optic thalamus was distended and swollen, and a tumour (glioma) was found invading the external portion of the optic thalamus, as well as the corpus striatum, almost as far as its anterior third; the capsule was not involved in the growth. The *left* optic tract, as far as the chiasma, was markedly flattened and pressed upon. The right half of the brain was intact.

J. B. L.

LIEBRECHT (Berlin). On Tumours of the Uveal Tract. *V. Graefe's Archiv.* XXXI. 4.

The first part of this paper refers to cases of irido-choroiditis, with nodular deposits on the iris. The author reviews shortly the various examples of this disease which have been published, noting the points which they seem to have in common ; thus, all the recorded cases occurred in young people who, although for the most part not actually suffering from tubercle, were yet delicate, badly built, and generally in poor health : several also had enlarged strumous glands. The course of the disease is usually more or less the same : it is characterised by a moderate pericorneal injection with little or no pain ; Descemet's membrane shows the well-known deposits, and the vitreous is slightly clouded ; some small whitish or reddish-white nodules appear on the iris, growing forward into the anterior chamber, and are hardly influenced by any treatment ; at the same time a plastic exudation takes place, with the formation of posterior synechiae as a result. Recovery is generally slow, usually taking months, sometimes years, but the nodules eventually disappear, and leave only little patches of pigment to mark their previous situation. The amount of vision retained depends chiefly on whether or not many synechiae have formed, and the pupil, in consequence, become more or less occluded ; in those cases where it was possible to examine the fundus after the disease had run its course, no abnormality was discovered at the back of the eye. Of the eleven published cases, three had been under observation too short a time to admit of an opinion as to their ultimate condition, three recovered perfectly with good sight, two showed marked improvement after long-continued treatment ; in two others occlusion of pupil and beginning phthisis bulbi were noted, while in the remaining case (which, however, is set aside by the author as probably not belonging to the same type of disease), the globe, after repeated iridectomy, was excised, owing to irritation, apparently sympathetic, which was set up in the other eye.

With regard to the nature of the affection there is considerable difference of opinion, but the majority of authors believe it to be tubercular. Liebrecht at this point gives notes of a case which has recently come under his own observation, but as it presents nothing unusual we do not quote the particulars. The patient did well, the eye recovering completely with $V = 1$ in four months after the first symptoms were observed.

The second part of this article is devoted to the study, from a statistical point of view, of the published cases of local uveal tuberculosis, and notes of two fresh ones are given. The points considered are (1) the age of the patients; (2) the connection of the local eye affection with tubercle of other organs; (3) the verification of the tubercular nature of the new growth; (4) the method by which uveal tuberculosis spreads; and (5) the treatment advisable. Fifty-six cases are described in the literature of this subject, forty of tubercle of the iris, and sixteen of the choroid.

With reference to the age at which liability to the disease seems greatest, the following table shows the greater susceptibility of youth. Of the fifty-six there were —

Under 10 years	...	...	...	29 patients
From 10 to 20 years	...	...	...	13 "
" 20 " 40	"	...	...	5 "
" 40 " 60	"	...	...	2 "
" 60 " 62	"	...	...	1 "

while in six instances the age was not given.

As regards the second question—the presence or not of tubercle in other organs, coincident with the local affection—our author points out that the statistics vary greatly according as they are drawn from observations made early or late in the history of each individual case; thus the following table gives the result of observations made at the outset, or early in the course of the disease:—

No apparent tubercle in other organs	26 patients
Tubercle elsewhere	...
The point not noted	...

but this proportion is much altered if we take our facts at

a later stage of the illness, *i.e.*, at times varying from some months to a few years after its outset ; then we find—

Suffering from tubercle elsewhere or			
died from this cause	...	...	31 patients
Healthy : no tubercle anywhere	...	7	„
Point not noted	...	8	„
Observed only for a short time	...	10	„

Of the seven healthy individuals, three were seen for periods not exceeding five months, while the remaining four had been under observation for four, six, eight, and thirteen years respectively.

The diagnosis of the uveal tubercle (the third point in the inquiry) was assured in the fifty-six cases as follows :—

Macroscopically	...	...	...	5 cases
By the histological structure	...	...	31	„
„ „ „ and				
successful inoculation on animals	...	6	„	
By the structure and the presence of				
tubercle bacilli	...	...	10	„
By successful inoculation and the presence				
of tubercle bacilli	...	...	4	„

In nine instances, tubercle bacilli, although carefully sought for, were not found.

Before passing on to the consideration of the fourth and fifth points previously indicated, the author reviews the evidence bearing on the relation of tuberculosis of the uveal tract to that of other organs; or, to put it in another way, discusses the question, Is there such a thing as primary uveal tubercle? Although some authorities take this for granted in all cases, where, even at an early stage, it is impossible to assure oneself of the presence of tubercle in other parts, there are many who as strongly deny its possibility, and look upon uveal tubercle as invariably secondary. Liebrecht sides with the latter class, and supports his contention by a reference to figures. While there are only four instances of people attacked by the local affection, who, after prolonged

observation, were still found to exhibit no other tubercular symptoms, there are thirty-one examples where the converse stands true, and, of these thirty-one, fourteen have already died, ten from meningeal, and four from pulmonary tubercle. Even in the case of the four healthy persons, one is not at liberty to assume that there is not, or has not been some tubercular mischief other than the local one, which might well have escaped detection; granting this, however, the question of priority still remains a difficult one to settle, and, although the weight of evidence is probably in favour of the view which regards the local affection as secondary, neither side can assert that the matter is beyond dispute.

To the method by which the disease spreads we need hardly refer. The author indicates the two ways in which this generally takes place: one, a gradual extension of the malady throughout the whole uveal tract, which becomes thickened and more or less disintegrated before the sclera is involved; and the other a more isolated form, where the changes are confined to a small part of the choroid or iris—the surrounding tissue being sometimes left intact—but growing rapidly forwards, and usually perforating the sclerotic or cornea at a comparatively early stage. Tubercle of the iris belongs, as a rule, to this latter class. The tendency of growth is from behind forwards, and we find accordingly that in cases where the choroid is affected the iris generally becomes involved, but that it is quite exceptional to find extension occurring in the reverse order.

We may dismiss the question of treatment in a few words. In cases where the changes are confined to a small part of the iris, iridectomy has been repeatedly tried, usually with conspicuous non-success; one instance, however, is recorded, where, by two iridectomies, a radical cure seems to have been effected. So long as the disease has not spread beyond the globe, enucleation may be performed with some hope of a favourable result, but, if the sclerotic has been ruptured, and the orbital tissue involved, operative interference is probably worse than useless.

The first of the two cases of which Liebrecht appends notes, is one of localised tubercle of the choroid. The patient, then a child of eighteen months, was originally seen in April,

1878. Her general health seemed good, and there was no tubercular history in the family. The eye was excised forthwith, placed in Müller's fluid, and not examined till twelve years afterwards. A detailed description of the microscopic characters is given, but it is unnecessary to repeat it here; it should be noted, however, that the sclerotic had been perforated by the growth, and that tubercle bacilli were found, although in small numbers, in some of the sections which were examined with a view to their detection. The child's subsequent history is of interest, inasmuch as for ten years after her eye was removed, she seemed to be in perfect health, but, during the last two years, she has developed symptoms of phthisis pulmonalis at the apices of the lungs.

The second case is one of tubercle of the iris, complicated with severe head symptoms and intensely-marked optic neuritis on both sides. The growth was limited to the lower part of the left iris; the changes in the fundus were restricted to the discs and their immediate neighbourhood, and during the month that the patient—a child aged six years—was under observation, no alteration occurred, except, perhaps, a little increase in the size of the nodules on the iris. There was a definite family history of phthisis, and although when she was first examined the lungs seemed clear, pulmonary symptoms soon set in, and the girl died nine months after her illness began. No autopsy was made, but tubercular meningitis, probably associated with tubercle deposit in the cerebellum, was suggested as the most likely diagnosis.

N. M. ML.

(1) A CASE OF RETINAL HÆMORRHAGE,
SHOWING PECULIAR SCOTOMA. (2) EM-
BOLISM OF A BRANCH OF THE
RETINAL ARTERY.

BY J. TATHAM THOMPSON, M.B.,

OPHTHALMIC SURGEON TO THE CARDIFF INFIRMARY.

Case I.—Mrs. M——, a widow lady, aged 51, sent to me by Dr. Steel, of Abergavenny, consulted me on May 1, 1890, and gave the following history:—

On the previous day, whilst in church and rising from a kneeling position, she noticed a peculiar appearance presenting itself between her and any object looked at. This was especially marked when looking at any light background. To use her own expression, “she saw a goat’s head, with the horns curved back, in front of her wherever she looked.” She had felt no pain or shock of any kind, and imagined that she had got some foreign body in the eye, till she consulted her family physician.

Externally, there was nothing abnormal to be distinguished; both pupils were equal, and reacted well both to light and accommodation. Vision L.E. = $\frac{2}{20}$, and she read J. 1 with + 1 D. R.E., V = $\frac{3}{20}$, J. 16.

Before making any ophthalmoscopic examination, I determined to take perimetric tracings of her fields of vision, to see if they corresponded in any way to the peculiar scotomatous patch referred to in her history. The field of the left eye proved to be perfectly normal; but the right showed a nearly central scotoma, which certainly bore a rough resemblance to a goat’s head, and this chart is reproduced in the wood-cut.

The perimeter used was McHardy’s self-registering

M

one, and the course adjustment was employed so as to get as large a map of the scotoma as possible. In certain directions the outlines of the scotoma were most sharply defined, whilst in others, as shown by the shaded lines in the illustration, the transition was gradual. In the parts left white the scotoma was absolute as far as perception of the test-object went.

On ophthalmoscopic examination the media were found to be perfectly clear, and the cause of the scotoma

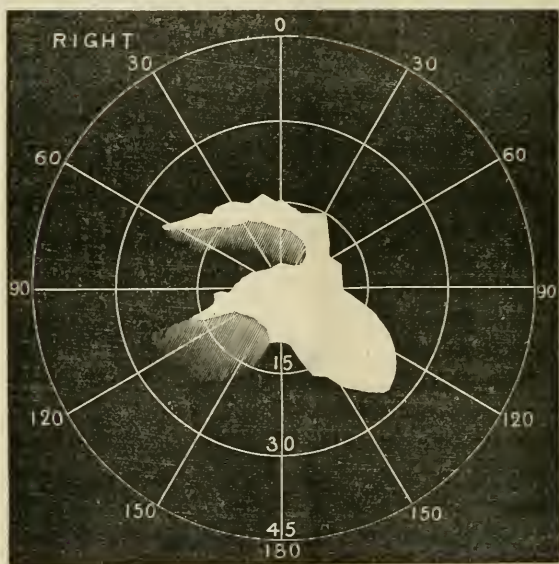


FIG. I.

discovered in a peculiarly-shaped retinal hæmorrhage, the principal part of which lay above and to the temporal side of the disc, but from which there extended two crescentic arms, the lower borders of which were sharply defined, whilst the upper margins shaded away considerably. Three or four very small outlying hæmorrhagic patches were also noted; the macula lutea was apparently involved in the upper of the two branches of the hæmorrhage.

So far as could be ascertained, the hæmorrhage came from the ascending temporal branch of the retinal artery, and the lower of the two branches of the hæmorrhagic area seemed to be limited, to a certain extent, by one of the larger veins. The distal portion of the artery involved was filled with blood, but it was not considered advisable to try whether any pulsation could be seen on pressure, for fear of inducing further hæmorrhage.

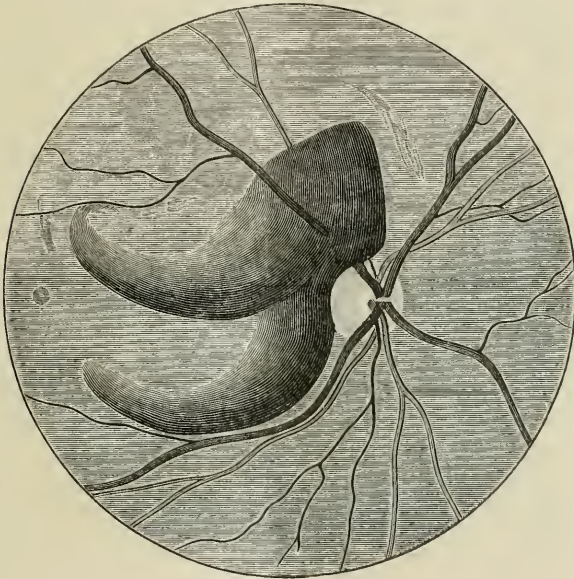


FIG. 2.

The patient was a short, stout lady, of rather florid complexion, of active habits, and it was found that the day before the scotoma appeared she had been undergoing rather severe muscular strain in lifting carpets and kneeling a good deal. She was, however, most positive as to having noticed nothing of the blind patch before going to church the previous day. Dr. Steel could give me no history of renal or cardiac disease, but there had been some general rheumatic

symptoms. As complete avoidance as possible of excitement and exertion was advised, and she was especially warned against stooping or lifting any weight; potass iodide was administered internally. I saw the patient again in the course of a week, and her central vision had slightly improved, but the scotoma had enlarged. It was found that some detachment of retina had occurred, and some weeks later this detachment involved a considerable area towards the upper part. Several months later the central vision was found to have improved to $\frac{20}{200}$, but the field of vision considerably reduced below the middle line, the blind area being almost one-sixth of the whole field. The case seemed to be of interest as showing that the occurrence of retinal hæmorrhages may possibly in some instances be responsible for a supposed "supernatural appearance."

Case II.—Miss F. G. L——, age 15, was brought to me on October 3rd, 1889, with the following history:—On rising that morning she found that on covering her right eye she could not see objects below and to the nasal side. "There was a dark triangular patch in front of her wherever she looked."

The patient was tall and well developed for her age, but her mother stated she had never been very strong. Had suffered at times rather severely from chorea, and still showed signs of choreic movements of the hands. She had had rheumatic fever, and any excitement or exertion was liable to bring on palpitation and breathlessness.

External appearances of the eyes normal. Pupils equal and active.

R.E., V. = $\frac{20}{200}$, with -2.5 D. sph. = $\frac{20}{200}$, reads J. 1.

L.E., V. = $\frac{20}{200}$, with -1 D. sph. = $\frac{20}{200}$, reads J. 1.

Perimetric chart, as in the wood-cut, shows a blind segment below and to the nasal side. The transition line very marked. Testing roughly with the hand, she described the tips of the fingers coming into view

as clearly defined, whilst nothing was seen of the hand ; and, testing with the perimeter, the blind area could be most accurately mapped out.

On ophthalmoscopic examination, a blanched segment of retina was seen above and to the outer side of the disc, occupying nearly a quarter of the total area. The limits of this blanched part were not sharply defined. The lower border did not reach the macula, which showed a slightly darker colour than the sur-

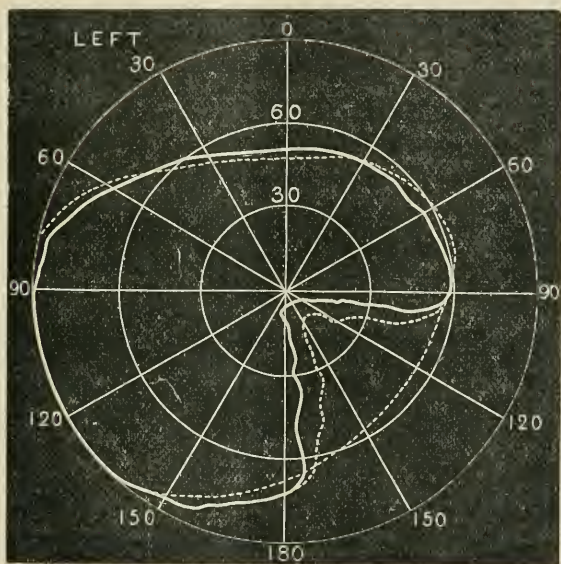


FIG. 3.

rounding retina. Upper subdivision of the retinal artery had apparently branched before reaching the margin of the disc, and the temporal branch which supplies this blanched area was seen to have in it an interrupted column of blood, having very much the appearance of a thin column of mercury in a thermometer tube that had been violently shaken. There was no movement of the blood in the vessel. Just at the point where the vessel crosses the edge of the disc,

a greyish object could be made out, and this was taken to be the embolus. Towards the periphery the blood column in the branches of the artery involved was complete. No engorgement of veins could be made out.

Twenty-four hours after being first seen, the embolus had apparently disappeared, and the artery was filled with blood. The area involved still showed some blanching, but not so marked as the day before. The blind area precisely the same as before, as taken by the perimeter.

On October 10th, there was found to be perception of bright light in that part of the field, and the area had very slightly diminished. Central vision, L.E., $\frac{20}{80}$ — 1 D. sph. $\frac{30}{80}$.

January 10th, 1890. There was no longer such a sharp transition between the blind and normal areas. Perception of moderate light over the whole. Seen some months later, there was found to be perception of movements of highly illuminated white objects over the part of the field affected, but no further reduction of the scotomatous area. She stated that she had quite ceased to notice the defect unless the other eye was covered. Certainly, not more than 36 hours had elapsed from the time of impaction of the embolus to the time when the blood current was re-established, and yet it would seem as though the retina could never fully recover the temporary cutting off of its blood supply. The only treatment adopted was that of gentle massage and the administration of saline purgatives. The dotted line in the wood-cut represents the chart taken on January 10th; the plain line the one on the day the case was first seen.

RESULT OF OPERATING IN CASES OF XEROSIS CO-EXISTING WITH TRICHIASIS.

BY KENNETH SCOTT, M.B., F.R.C.S. (EDIN.)

OPHTHALMIC SURGEON, KASR-EL-AINI HOSPITAL, EGYPT.

I wish to draw attention to the markedly beneficial results which have accrued in two cases of xerosis by operating on them for the condition of trichiasis which was present in both.

The two cases were treated by me in the Kasr-el-Aini Hospital, one of them in June, 1890, and the other in the beginning of the present year. The notes of the history, condition on admission, and treatment, with its results, were almost exactly similar in both, so that it will suffice if I describe only one of them minutely.

The patient was a native, aged 45, and was admitted to hospital on January 21st, 1891, suffering from trichiasis and xerosis in both eyes. He was fairly well nourished, and was able to follow his occupation as a baker until three years ago. He had suffered, in both eyes, from trichiasis for six years, and from xerosis for three years.

In both eyes the upper eyelids were thickened and slightly inverted, and had cicatricial traces of trachoma on their palpebral surfaces; the eyelashes swept against the cornea. Lachrymal secretion was entirely absent. The ocular conjunctiva was of a dingy brownish colour, dry, leathery, slightly puckered into folds, and insensible to touch. The cornea, also insensible to touch, was dull, whitish, dry and opaque, and it was impossible to see anything of the anterior chamber or iris through it.

I operated on him for trichiasis on January 27th, and on the fourth day afterwards there was evidence of distinct improvement, as there was a slight return of lachrymal secretion, and some soft white flakes appeared

adhering to the central portion of the cornea. In two or three days these flakes gradually separated off, and the cornea was found to be more transparent than formerly.

On the seventh day after operation there was copious lachrymal secretion, and, accompanying it, a fresh appearance of desquamating flakes on the cornea, which came away in the course of the following two days, leaving the cornea still clearer ; and now the pupil, and the colour and surface of the iris, could be distinctly seen.

I may mention that in performing the operation for trichiasis, I in no way approached even the vicinity of the lachrymal gland or its ducts.

On February 25th, five weeks after admission, the patient was discharged, cured of the trichiasis, with the lachrymal secretion restored, and his vision very greatly improved.

I saw him again three months afterwards, and in both eyes, the cornea, now fully sensitive, was clear, though not fully transparent, as there was still a certain degree of thin uniform opacity ; its surface was polished, and the pupil and iris could easily be distinguished through it. The lachrymal secretion was normal, and the ocular conjunctiva had quite lost its former peculiar dried appearance, and was now tensely smooth, glistening and sensitive, and allowed the sclerotic, normally white in colour, to be seen. Patient is quite illiterate, but could count fingers with the right eye at eight feet, and with the left at six and a-half feet, and this improvement in vision, according to his own account, and verified on examination, was steadily increasing.

The other patient's case exactly resembled, almost in every detail, that which I have described, except that observations could only be made on one eye, as the other was disorganised and painful, and had to be removed. He was admitted to hospital on June 21st, and discharged July 28th, 1890. I have not seen him since then.

I had another case, a woman, under my care, with parenchymatous xerosis, not quite fully advanced, and with trichiasis. The progress of the malady seemed to be wholly arrested after operation, and before she was discharged there was a marked improvement in the condition of both her eyes, and in the abundance of the lachrymal secretion.

No other treatment was employed after the operation, beyond keeping the eyes clear with boracic lotion, and applying vaseline to the flakes which desquamated from the cornea.

G. FREUDENTHAL (Göttingen). On Sarcoma of the Uveal Tract. *Von Graefe's Archiv*, Vol. XXXVII., part I, p. 135.

This is a statistical paper of considerable value. At the suggestion of Professor Leber, the author collated all the cases of sarcoma of the uveal tract which came under observation in the eye-clinic at Göttingen during the 16 years from 1874 to 1889. Concerning all patients who underwent operation, he obtained, when possible, a history of the subsequent course of the case.

Among 57,190 persons treated at the clinic during this period, there were 24 affected with the disease in question, giving a proportion of 0·04 per cent. Computed in the same way, Hirschberg found 0·05 per cent.; Fuchs 0·06 per cent.

The disease was very unequally distributed between the two sexes, only twenty per cent. of the patients being women. Some other observers have found a larger proportion in the other sex. The discrepancy is doubtless accidental, for in the much larger number of cases collected by Fuchs the distribution was nearly equal in the two sexes.

There was no evidence to show that the disease attaches itself especially to any particular trade or occupation.

The age varied between 28 and 69 years, the average being 49 years. Lawford's statistics show an average age of 58 years, those of Fuchs 44 years.

There is no evidence either, in these cases, or in those previously collected by other observers, to show that a greater liability attaches to the one eye than to the other.

The cases came under notice in various stages of the disease. Thus, six cases were diagnosed in the stage of retinal detachment and functional disturbance without glaucomatous complication; seven patients were seen in the glaucomatous stage, the stage in which the disease is apt to be mistaken for primary glaucoma. In 11 cases episcleral nodules had already formed. These were usually discovered only after excision, but in two instances revealed themselves beforehand by exophthalmus and diminished mobility of the globe. The external growth was in two cases widely adherent to the adjacent tissues.

Metastatic formations were not diagnosed in any case before excision of the eye.

Well-marked opacities or ulcers of the cornea were observed in three instances; cataract in seven.

Normal tension was noted in eight cases; increased tension in 15; shrinking of the eye in one. The so-called phthisis bulbi in this last was not due, as at first surmised, to a perforation, but to internal inflammation. Such inflammation may explain the occasional occurrence of sympathetic iritis, of which condition Fuchs has collected six recorded instances.

The operation performed was, in 21 cases, enucleation of the eye with resection of the optic nerve; in three cases total exenteration of the orbit with removal of the perosteum, and in two of these latter a complete removal was found to be impossible.

A local return of the disease in the orbit or its neighbourhood occurred in six cases, *i.e.*, in 25 per cent. of the whole, a much higher percentage than has been recorded by other observers. The interval of time between the operation and the recurrence in these six cases was, in round numbers, ten years, three years, one year, six months, two months, and one month. In only one of the cases was a

metastasis to a distant part diagnosed ; most of the patients died from sarcoma of the brain. The interval, in the first case, of ten years is very remarkable. The enucleation was performed at a very early stage of the disease when there was only slight detachment of the retina, hardly any impairment of central vision, and no sign of any extension through the tunics. After ten years, during nearly the whole of which time the cure had seemed to be complete, the patient returned with a well-marked recurrence in the orbit. This was removed by exenteration with removal of the periosteum ; the recovery was good ; there is no further record. The orbital tissue was found to include a sarcomatous nodule measuring 2 cm. in its longest diameter and not implicating the optic nerve.

In four other cases there was a recurrence of the disease in the liver, but none in the neighbourhood of the orbit. Including the one belonging to the previous group, this makes five cases of metastasis in the liver. In one of these the eye had been removed in the pre-glaucomatous stage, in one during the glaucomatous stage, in the other three, after the growth had perforated the sclera.

Excluding cases in which the eye had been removed within a period of three years, as being still uncertain, there were six, *i.e.*, 37.5 per cent., in which the disease after a period of more than three years had shown no sign of return, and which may therefore, with great probability, be considered as permanently cured. This agrees closely with Hirschberg's estimate, while Fuchs', differing in this respect from all other observers, reckons the proportion of permanent cures as low as 6 per cent.

The prognosis in these cases, especially when they come early under treatment, is certainly not so hopeless as some authorities have held it to be. If after three or four years from the time of operation there is no sign of recurrence, we may, with considerable confidence, though not with absolute certainty, regard the cure as final.

At the end of this article is a list of seven other papers, in which statistics of uveal sarcoma are to be found.

P. S.

NICATI (Marseilles). * The Gland of the Aqueous Humour ; Gland of the Ciliary Processes ; or Uveal Gland. *Arch. d'Ophtal.*, March—April, 1891.

This is the third and final part of Nicati's paper on the uveal gland. The beginning of the number refers to the influence of the sympathetic on the fibrinous secretion of the gland, to which attention has already been drawn. The author comes to the following conclusions :—

Section of the cervical sympathetic does not induce the secretion.

Section of the sympathetic in the neck slows this reflex secretion on the opposite side ; it does not slower it on the same side as the section, but, on the contrary, may slightly hasten it ; the slowing of the reflex on the opposite side is a constant result and has been verified by numerous experiments. The author attributes it to the fall of blood pressure due to the division of a vaso-motor nerve.

Hemisection of the cord in the neck retards the reflex on both sides, but always less on the side of the section than on the other. Nicati thinks this conclusion is in strict accord with the preceding one, and accounts for the more exaggerated effect produced, by the greater reduction of blood pressure which follows the operation. Were it possible to divide the ocular filaments of the sympathetic without, at the same time, affecting the general blood-pressure, we should by so doing accelerate the reflex fibrinous secretion ; by stimulating the filaments, on the other hand, the reflex would be retarded.

Iridectomy delays the reflex ; thus, a month after an iridectomy had been performed on the right eye of a dog, 0.5 centigr. of fluoresceine were injected under the skin, and eighteen minutes later both corneæ were punctured ; the left chamber began to fill with green fluid in two minutes ; the right in four minutes. In order further to study its influence on the secretion, the author removed the whole

* For reference to the two previous parts of this paper, see p. 105.

iris in several instances. He found it better to use dogs than rabbits for this experiment, the operation in the latter case involving more risk to the ciliary processes than in the former. The result showed that removal of the iris delayed the secretion to a marked degree, much more, indeed, than a simple iridectomy. Pinching the iris hastens the reflex. Nicati concludes, therefore, that irritation of the iris stimulates the secretion, while removal of it, in part or whole, has the opposite effect.

PATHOLOGY.

There are two affections, says the writer, which have a close connection with the function of the uveal gland, and these are (1) glaucoma, and (2) detachment of the retina. First as regards glaucoma.

Retention of the aqueous humour may be brought about either by obliteration of the channels through which the fluid makes its way into the anterior chamber (occluded pupil), or by absence or insufficiency of the means of escape from the anterior chamber (impermeability of the iris).

As illustrating the condition of completely occluded pupil by persistent pupillary membrane, Nicati describes a case, to which he has already made a brief reference in the physiological section of his paper, where this had occurred in a cat. The anterior chamber was normally deep, and the aqueous showed a very slightly flocculent deposit; the iris was not unduly stretched; the pupil entirely closed by a continuous membrane springing from the front of the iris a little outside the pupillary border; the posterior chamber was of enormous depth, in bulk equal to about half that of the eye; the character of the fluid in this chamber seemed similar to that in the anterior one; the ciliary processes were thinned and stretched; the lens in its natural position, and the vitreous, choroid and retina healthy.

In conjunction with cases such as this should be mentioned others where the occlusion, at first complete, has been rendered partial by the rupture of the persistent membrane, thus allowing communication between the two chambers to be established. The author quotes an apparent example of this.

Occlusion of pupil by adhesion of the iris to the lens is of comparatively common occurrence, and need not be more than mentioned.

Impermeability of the iris (the second cause of retention of aqueous) may be accounted for in five different ways, viz., (a) Owing to congenital insufficiency of the iris : here the chambers, anterior and posterior, are both deep, the former especially so ; the iris is grey and atrophied, the pupil sluggish or immobile, usually somewhat dilated, tension is plus, and the disc, as a rule, excavated. Vision fails gradually, but may be retained in part for years ; in the end the lens often becomes cataractous, or phthisis bulbi supervenes. If the atrophy here described is secondary to long-continued pressure, as may indeed be maintained, why, asks the writer, does one find cases of glaucoma of old standing where there are absolutely no signs of atrophy of the iris ? An instance of this kind has quite recently come under Nicati's observation. (b) By progressive atrophy of the iris : a case is quoted from Mauthner in support of the contention that retention of aqueous may be due to this cause. (c) By inflammatory engorgement of the iris. (d) By the reduction of its absorbing surface following the use of atropine. (e) By inadequacy of the iris to perform its functions, due to senile, rheumatic or gouty changes.

Iritic irritation tends to induce glaucomatous attacks. The experimental pinching of the iris was accompanied in each of the author's experiments by a large opening into the anterior chamber, and the consequent raising of tension, which might otherwise have occurred, did not take place. For the same reason he believes that rise of ocular pressure does not follow operative interference in the human eye, at least if the patient be young and the iris healthy. He records, however, two cases where, in old people, traumatic irritation induced acute glaucoma, viz. (1) in a woman, æt. 70, whose eye was needled for opaque membrane after cataract extraction. There were several adhesions to the capsule, and in breaking this up the iris was necessarily dragged upon with considerable force. Violent glaucoma set in the next night, but was relieved by a simple puncture into the anterior chamber ; (2) in a man, æt. 74, whose iris

was caught in the corneal wound after an ordinary cataract operation ; eight days later he developed intense glaucoma.

The increase of ocular pressure observed in such cases is the result of œdema of the chorio-capillaris. Anatomically it is perhaps impossible to demonstrate, at any rate in the human subject, this œdema, which is essentially of a transient nature, but the author thinks that when we remember the anastomosis which takes place between the vessels of the chorio-capillaris and the central vein, evidence of the œdema is furnished by the little bundles of varicose vessels often to be seen on the discs of glaucomatous eyes. Other causes of irritation to the iris, other than traumatic, may produce the same effect ; thus, excessive instillation of eserine has been known to induce acute glaucoma even in cases in which, when at first applied, it had diminished the ocular tension. Iritis, continuous efforts of accommodation, and prolonged exposure to a bright light may also, under certain conditions, provoke œdema of the chorio-capillaris and cause glaucoma.

Retinal venous engorgement, more or less pronounced, is the result of heightened tension in the globe, and this, in its turn, produces (1) œdema of the retina itself and (2) œdema of the vitreous, or, in other words, hydrophthalmos posterior. The dilation of the retinal veins, observed under pressure of the finger on the eye, the perineuritic retinal halo and the excavation of the disc in obvious cases of retained aqueous are cited as evidence of this.

The consideration of the facts recorded above suggests a theory as to the nature of glaucoma which implies two separate processes as promoting its development : thus, retention of the aqueous humour is the primary and chief means of effecting glaucoma, and frequently is alone sufficient to induce the simple chronic form, and, in young subjects, to distend the parts of the eye situated in front of the uveal gland. The other cause is the spasmodic œdema of the chorio-capillaris which is set up by irritation of the iris, and is apt to give rise to the acute exacerbations of the disease ; this cause may be regarded as accidental and almost secondary to the other.

Before closing his remarks on glaucoma, the writer refers

briefly to the various operations in vogue, regarded more particularly in the light of the double indication which he thinks it incumbent on us to follow ; *i.e.*, to favour escape of the aqueous and to render the spasmodic choroidal œdema impossible. Posterior sclerotomy, or puncture of the vitreous, responds to the first indication but not to the second ; a further objection to it is that its effect is only temporary. It has, however, advantages under certain circumstances, *e.g.*, performed before an iridectomy it helps to re-establish the anterior chamber, and thus to lessen the danger of wounding the lens ; it tends also to reduce the risk of prolapse and to promote thorough cicatrisation when practised after iridectomy. In cases of persistent tension, or adherent total leucoma it is practically the only course open, short of enucleation. Anterior sclerotomy, or the formation of a fistula connecting the anterior chamber with the cellular tissue under the conjunctiva, while it has not all the merits of the previous operation, is subject to the same objections. Sclero-iridectomy, or Graefe's operation, is the only one which fulfils the double purpose of allowing—by the sclerotomy—the escape of aqueous, and preventing—by the iridectomy—the œdema of choroid.

Progressive detachment of the retina is, according to the author, produced by the aqueous humour. He believes that there is direct communication between the sub-retinal effusion and the fluid of the posterior chamber. He has punctured the anterior chamber in patients with detached retina, and has observed, after the escape of the aqueous which resulted, the sudden reapposition of the displaced retina, proving that the fluid under the detachment has been evacuated at the same time as the aqueous. This, in conjunction with the statement that the anterior chamber, after such puncture, has been seen to fill again immediately (without the ordinary physiological interval), and showing therefore that the fluid was already formed, testifies to the accuracy of the author's contention. The following facts are also cited in its support :—(1). The usually anterior situation of the detachment, and its extension from the front backwards. (2). The occasional presence of cholesterine crystals in the subretinal fluid and the anterior chamber at the same time,

suggestive of a communication between the two. (3). The frequent occurrence of separation in the morning, after sleep. Owing to its abnormally fluid state, a certain amount of the vitreous is absorbed, especially during sleep, and the reflex secretion of the uveal gland is called into play as a consequence. (4). The liquid state of the vitreous, established beyond all doubt by pathological examination.

N. M. ML.

WAGENMANN (Heidelberg). Observations on the Pathological Anatomy of Retinitis Pigmentosa. — *Von Graefe's Archiv. XXXVII. 1., p. 230.*

In a previous number of *Graefe's Archives*, Wagenmann published an account of experimental work in relation to the nutrition of the choroid and retina (see OPH. REV., May, 1891). As a result of this work, he was led to think that the disease known as retinitis pigmentosa might be really a degeneration of the retina secondary to, and dependent upon, changes in the choroid coat.

In the paper now before us, he gives a full account of the examination of an eyeball affected with retinitis pigmentosa, and draws attention particularly to the condition of the vascular tissues.

The eyeball was removed, 24 hours after death, from a man, who had been under observation, and was known as a case of typical retinitis pigmentosa. He had been nearly blind, retaining only perception of light, and nearly deaf. He had a deaf, demented sister and a partially deaf niece, both of whom had retinitis pigmentosa.

The eyeball was hardened in Müller's fluid, and examined microscopically. The retina was thickened in its whole extent, this thickening being due to proliferation of the connective tissue elements. It was closely adherent to the choroid, from which it could however be separated. At the inner surface of the retina there was a definite layer of thickened connective tissue, with numerous small arched detachments, the spaces beneath these being filled by amorphous albuminous material.

The bacillary layer was almost entirely wanting, and was replaced by newly-formed fibrillated tissue.

The hexagonal pigment layer was much altered : in places it retained its usual arrangement of cells, but was devoid of pigment ; in other places several layers of cells were visible, and could be seen penetrating the superjacent layers of the retina.

The shape and size of the cells showed many deviations from normal. The nervous elements of the retina showed advanced degeneration, and, except over a small area close to the macula, had practically disappeared.

The retinal vessels were greatly sclerosed. The pigmentation of the retina was moderate in degree ; much of the pigment was arranged along the vessels, and in some obliterated vessels the lumen appeared to be filled by pigmented cells.

The cells of the pars ciliaris retinæ were much pigmented, and had undergone great proliferation. On their outer surface, between them and the choroid, was a moderately thick layer of newly-formed fibrillated tissue, extending as far posteriorly as the ora serrata.

In the optic nerve there was much thickening of the inter-fascicular trabeculæ, and wasting of the nerve-fibre bundles. The central vessels were not much altered, but many of the small vessels in the nerve showed thickened hyaline walls and narrowed lumen.

The choroid was decidedly thickened in a large part of its extent ; this thickening was caused by a considerable increase of the intervascular stroma. The walls of the vessels, both large and small, were greatly thickened, the change affecting chiefly the tunica adventitia and the tunica intima. The number of vessels in the choroid seemed to be diminished, and the chorio-capillaris, as a definite layer, had disappeared. Immediately beneath the lamina vitrea was some homogeneous tissue containing multipolar cells. The ciliary processes were badly developed, and some had almost disappeared. The ciliary muscle appeared normal.

The iris showed decided changes in the vessels, in many of which the inner and outer coats were thickened, opaque, and hyaline.

The vitreous had undergone extensive degenerative change, of an unusual character, and the lens showed degeneration of fibres at the posterior pole; a posterior polar cataract had been diagnosed during life.

Wagenmann remarks that the changes in the vascular tunics in this case, which clinically was an undoubted case of retinitis pigmentosa, were unmistakable. Leber, writing in the *Graefe-Sæmisch Handbüch*, said that the choroidal changes in the cases described up to that date were unimportant, but added that the ophthalmoscopic appearances rendered it probable that the vessels of the choroid were frequently sclerosed in retinitis pigmentosa. If the primary seat of the disease is chiefly, if not exclusively, in the choroid, changes in this tunic should be found in all specimens examined microscopically.

The pigment in the retina, Wagenmann thinks, is undoubtedly derived from the hexagonal pigment layer, and not from the pigment of the choroidal stroma, as held by Wedl and Bock. The extensive changes found in the hexagonal pigment layer he looks upon as secondary to changes in the choroid which interfere with the nutrition of the pigment cells. This opinion is mainly the outcome of his experiments on animals.

J. B. L.

OTTO SCHIRMER (Königsberg). The value of Weber's Law for the Light-sense. *Von Graefe's Archiv*. XXXVII. 4, 121.

Schirmer has been led to investigate this subject in consequence of both Aubert and Helmholtz having underrated the importance of adaptation in their experiments.

Weber's law may be expressed as follows: the perception of the difference between two stimuli of the same kind depends upon the relation between the stimuli, and not upon the amount of the actual difference.

Schirmer's experiments were made by daylight, and with Masson's disc. He found that his power of perceiving

the smallest differences in illumination increased by practice. This power, which he regards as synonymous with the light-sense, at first only gave a sensation when the illuminations compared were as 1 to 128. After eight days' practice he could perceive illuminations as 1 to 204, or as 1 to 227. His observations give a higher value of light-sense than those found by Aubert and Helmholtz, which may possibly depend upon subjective conditions peculiar to the observers. Schirmer, having ascertained his mean light-sense to equal $\frac{1}{217}$ (which signifies that a dark object with an illumination = 1 can be distinguished against a light ground when the illumination of the ground = $\frac{218}{217}$), made experiments with various degrees of total illumination, the relative values of the different stimuli being unchanged, and he found that his light-sense still equalled $\frac{1}{217}$ between all the various illuminations from 1,000 to 2'5, or 5 standard candles.

These observations upon the light-sense are fully in accord with those of Uhthoff upon visual acuity with various degrees of illumination (*vide* OPH. REV. VI. p. 146), and also with those of Carp and Doerinchel. Kraepelin has found that Weber's law holds good between illuminations which are related as 9'61 : 1,000. But he observed with a light-sense of only $\frac{1}{121}$, which detracts from the value of his observations. His views that adaptation and pupillary reaction have no influence upon the validity of Weber's law cannot be accepted; indeed, it is difficult to make out exactly what his meaning is, when he states that the law depends solely upon psychophysical conditions, and yet requires the retina to be adapted for the prevailing illumination before the law can be applied. As far as pupillary reaction is concerned, Kraepelin experimented with too low degrees of illumination for sound conclusions of any kind, and it is not surprising that in such faint light, atropine mydriasis should slightly raise the value of the light-sense. In the middle degrees of light the loss of pupillary reaction can doubtless be made up for by corresponding retinal adaptation.

In this connection Schirmer mentions an interesting observation. If he awakes in a dark room, gets himself

before a looking-glass, and then strikes a match, he finds his pupil is contracted *ad maximum*. In the day-time, after looking out of the window, if he darkens the room, and then strikes a match, he finds his pupil almost *ad maximum* dilated. This proves that with the same degree of absolute illumination, at one time myosis, and at another mydriasis may be produced, owing to the connection between the pupillary reaction and the adaptation of the retina.

Adaptation is a process depending upon three factors. First, the principal is some as yet unknown occurrence in the bacillary layer, which depends upon a normal relation between it and the pigmented epithelium; second, the optical effect of the latter, by which the bacillary layer is to a certain extent shaded in bright illumination; third, the pupillary reaction, which acts more rapidly than the other two.

Schirmer's conclusions are that Weber's law holds good for the light-sense between the illuminations of 1 and 1,000 standard candles, provided the eye is fully adapted; thus the law requires certain physiological conditions. These conditions are supplied by the adaptation alone without the necessary co-operation of any psychophysical process.

J. B. S.

MITVALSKY (Prague). On Metastatic Carcinoma of the Eyeball. *Archives of Ophthalm.*, XX. 2.

The author adds two fresh instances of this disease to the list of nine others already reported by different writers. With one exception—where the secondary growth affected the ciliary body and iris—the disease has invariably been located in the choroid, while the seat of primary tumour is usually the mamma. After a brief review of the published cases, Mitvalsky goes on to describe the two new ones—the first both clinically and histologically, the second only from a clinical point of view.

Case I.—F. K—, a woman, æt. 46, came to the hospital on February 16th, 1886, complaining that the sight of the left eye had been failing for a fortnight. Two years previously her left breast had been removed for cancer, and four months afterwards she underwent a second operation owing to a local recurrence of the growth. Since then she had done well. The axillary and supra-clavicular glands were enlarged, but there were no nodules in the cicatrix. The right eye was normal in every respect. L. V. = $\frac{6}{120}$, T.n. Media clear. Between the disc and macula there was a roughly oval growth, dirty yellow in colour, pigmented here and there, and raised at the centre, but shading off into the emmetropic retina at the sides. On its surface were some new vessels.

On March 1st, the retina was found to be detached over two-thirds of its extent; the vitreous showed delicate floating opacities. T. —.

March 15th.—Excision performed, owing to intense pain in eye and head: retina totally detached; eye glaucomatous.

On division of the globe by a horizontal section after hardening in Müller's fluid, the choroid was found in its inner third to be macroscopically normal, but elsewhere it was replaced by a yellowish carcinomatous mass extending on the temporal side nearly to the ciliary body.

Microscopic examination showed that the character of the growth varied somewhat in different places: thus,

towards the centre there was an undue predominance of dense connective tissue with comparatively few epithelial cell nests, while at the peripheral parts the connective tissue was finer and the nests more abundant. Throughout the connective tissue substance traces of choroidal pigment were found, indicating, as the author remarks, that the new growth must have taken origin from the pigmented choroidal stroma. In all the preparations numerous yellow points were detected which did not take any stain, and which dropped out when the sections were washed. The choroidal veins were dilated and the arteries small; the pigment cells were increased in number, but there was no evident round-cell infiltration about the vessels.

On the nasal side of the tumour the meshes of the suprachoroidea were dilated with remains of hæmorrhages; in this region extension had occurred chiefly in the suprachoroidea, but at the temporal margin the substance of the choroid below the chorio-capillaris was more particularly affected. Extensive hæmorrhage had taken place here, and in some of the preparations carcinomatous nests were observed in the hæmorrhage, either isolated or connected with other tubules. The retina showed comparatively little change; dilatation of its vessels, some displacement of the rods and cones, and slight peripheral cystoid degeneration being the chief deviations from the normal. The disc was not involved, and the remaining structures of the eye were hardly altered.

In reviewing the case, the author draws special attention to the yellow masses mentioned above, ascribing them not to degeneration of the carcinomatous tissue so much as to the *débris* resulting from hæmorrhages which had broken down. The fact that there was no indication of necrosis of the carcinoma cells in the immediate neighbourhood of the yellow patches would go far to prove that the tumour tissue itself was not the principal factor in their formation. Again, while the cancerous tubules were practically free from pigment, the necrosed areas were very markedly invaded by it, an observation which alone would almost imply a different origin for the two structures. Owing to the obstruction to the circulation, the conditions must have been unfavourable

to absorption, and the hæmorrhages might thus have broken down into more or less amorphous deposits, which had become surrounded by the gradually extending growth. Three stages of development specially noted at the periphery are described by the author, viz.: (1) that in which the cells develop into the tubule form; (2) where the tubules, ceasing to grow in length, increase in thickness; and (3) "that in which the necrotic area becomes surrounded, or appears cut off from the living tissue like a sequestrum." Conclusive proof of the justness of Mitvalsky's theory with regard to the origin of these yellow patches was not forthcoming, inasmuch as the presence of blood pigment crystals could not be demonstrated in the masses, but it is pointed out that the action of Müller's fluid and picric acid, both of which were used to harden the globe, are apt greatly to interfere with the efficacy of the blood reagents; indeed, both tests gave a negative result in the case of a large degenerated hæmorrhage about the nature of which there was no doubt.

Case II.—This is very briefly reported. A man, æt. 35, came to the clinic on October 25th, 1887, complaining of failing vision in the left eye. In March of the same year he had had a large cancerous tumour (scirrhous) removed from the left mammary region, together with some axillary glands which had become implicated.

Condition on Admission.—Axillary and supra-clavicular glands enlarged. Right eye normal. L.V. = $\frac{6}{80}$, with eccentric fixation. Media clear. T.n. Extending from the macula, about four disc diameters outwards, there was a dark yellow growth, pigmented here and there, and with a few white patches on its surface. The tumour grew rapidly. Metastatic new growth occurred in the cranial periosteum, and the patient died, with cerebral symptoms, two months after he was first seen.

N. M. ML.

O. SCHEFFELS (Crefeld). Pagenstecher's Advancement of the Levator Palpebræ for Entropion and Trichiasis. *V. Graefe's Archiv.*, XXXVI., 4, 265.

The proceeding of Pagenstecher is based upon the well-known operation of Hotz, which he has modified from time to time, until the final result is an operation which differs so much from its prototype that it deserves a place for itself as a distinct item in the list of entropion operations—a list already long enough in the opinion of many oculists.

The operation is performed as follows:—A small cut is made in the skin $1\frac{1}{2}$ inch below the upper border of the tarsus, and, this landmark being made, the lid clamp is applied and the incision prolonged the full length of the lid and deepened to reach the surface of the tarsus. The surface of the tarsus and that of the tarso-orbital fascia is cleanly prepared by a careful dissection, and then sutures are inserted by passing a needle (armed with a fairly strong silk thread) in through skin and muscle about one inch above the ciliary border, and out beneath the skin of the lower edge of the original incision. The operator then seizes the tarso-orbital fascia with a sharp-toothed forceps as high as possible above the upper border of the tarsus, and passes the needle through the upper edge of the tarsus, the tarso-orbital fascia, and the underlying tendon of the levator. It is then passed through the muscle and skin as high above the upper edge of the incision as the lid clamp permits. Two similar sutures are inserted at each side of the first, and then all three are tightly drawn and tied. The operation is done without narcosis, cocaine being dropped into the conjunctival sac and into the wound.

The immediate effect is to abolish the entropion and slightly raise the whole tarsus from the underlying eyeball. Pagenstecher attributes this almost entirely to the advancement of the levator, the action of which is further aided by the change in the position of its insertion. It now acts on the anterior portion of the lid, instead of as originally upon

the posterior, and tends to evert the ciliary border. Simultaneously the direct union of the major portion of the orbicularis with the upper border of the tarsus tends to shorten the under portion of the lid, and produces a pressure upon the upper tarsal border, which causes ectropion.

The operation has been performed some seventy times, and with permanent results in all cases, some having been observed for five or six years.

Pagenstecher does not agree with Hotz as to the etiology of entropion. Hotz attributes the defect chiefly to the relaxation of the skin and muscle of the eyelid, caused by long-continued blepharospasm; but blepharospasm *per se* has no power of producing entropion, and most cases of entropion from granular lids run their course without blepharospasm. The entropion is caused undoubtedly by the shrinking of the tarsus and the conjunctiva.

Pagenstecher's operation differs from Hotz's in avoiding the removal of any portion of the lid, and in establishing a firm cicatricial connection between the fibres of the orbicularis, the upper edge of the tarsus, the fascia, and the tendon of the levator, while at the same time advancing the latter and changing the direction of its pull on the eyelid.

The only combination that Pagenstecher occasionally uses with his operation is canthoplasty.

Of course, the operation of advancement of the levator is not *per se* a novel one, but the application of it for the cure of entropion is a novelty, which is worthy of notice.

J. B. S.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, MAY 7TH, 1891.

HENRY POWER, M.B., President, in the Chair.

Arterio-venous Aneurysm of the Orbit.—Mr. Richard Williams (Liverpool) reported the case of a youth, aged 14, who had been kicked by a horse on the left temple. The left eye had been "swollen out" since the accident, and the swelling was gradually increasing. At the upper and inner angle of the orbit there was an oval and pulsating swelling, about the size of a small walnut. Ligature of the common carotid was performed, and the pulsation ceased, but returned in some degree later, and then gradually subsided, until one day, whilst weeding in the garden, the eye felt suddenly painful, and the lids became swollen. Since then the pulsation had entirely ceased; the appearance and vision of the eye became normal, all that remained being slight ptosis and contraction of the pupil. Mr. Williams cited other cases in which compression or ligature of the common carotid had resulted in recovery, and expressed his opinion that this latter was the most satisfactory method of treatment.

Mr. Wherry (Cambridge) had ligatured the carotid in a lad with arterio-venous aneurysm appearing after fracture of the base of the skull, with double ptosis and optic neuritis. The operation was followed by very serious symptoms, coma lasting fourteen days, hemiplegia on the side opposite to the ligatured vessel, and almost complete loss of reason. He thought that some thrombosis had occurred at the time of the accident, and had extended rapidly when the blood-supply of the brain was curtailed by ligature of the carotid.

Mr. Frost mentioned a case under his own care in which the condition had remained stationary for some years, and

the man was able to follow his occupation as a wheelwright. He deprecated early interference in such cases, as a considerable number of spontaneous recoveries were on record.

Dr. Mules (Manchester) mentioned a case in which intermittent pressure on the carotid was applied by the patient himself.

Mr. Charles Lee (Liverpool) said he had had the advantage of seeing both the cases mentioned by Mr. Richard Williams, and he was an advocate for early operation. In one of the cases mentioned, operation had been postponed. Severe hæmorrhage occurred from dilated veins of the eye on the affected side, and the sight was lost.

Mr. Silcock mentioned a case he had shown to the Society some years ago ; no operation had been performed, and the man was now in practically the same condition.

Mr. Tatham Thompson (Cardiff) referred to three cases of arterio-venous aneurysm of the orbit. One, a girl under 10, perforated the orbit by falling on a knitting needle. The aneurysm which ensued was completely cured by electrolysis. In the second case, also in a child, the orbit was penetrated by the rib of an umbrella. In the third, a woman, aged 40, during a severe paroxysm of vomiting in pregnancy, experienced the sensation of a pistol crack in the eye, and ever after heard a buzzing noise. The *bruit* could be stopped by pressure on the carotid.

Mr. Cross (Bristol) referred to a case in a child, 15 months of age, in which the symptoms appeared after a fall. No operation was performed. Recent rapid increase in the symptoms made it doubtful if the case was not one of new growth.

Parageusia with Ophthalmoplegia.—Mr. Wherry (Cambridge) described the case of a gentleman, aged 47, who was first seen on December 9th, 1890. He had homonymous diplopia, worse on looking to the right. The right eye was kept shut in walking to avoid dizziness and double images. No signs of tabes dorsalis or of optic neuritis were present. Both pupils were dilated, did not act to light or with accommodation. The vision was not affected. He could read J. 1 at 10 inches, and write perfectly with both eyes, using his ordinary glasses. The attack began three

days previously, when he was in his usual good health. He noticed at table that everything tasted bitter ; he thought that saliva collected a little more on the left side of the mouth ; he had then occasional diplopia. On December 16th there was marked divergence and crossed diplopia, but each eye separately would move well to the canthi : with no weakness of any single muscle, convergence was impossible, and all near work was done with one eye, the left for choice. Some patches of numbness were noticed on the outer side of the left thigh and on the left little finger. Severe nocturnal pain in the head and scalp were relieved by hot compresses. The taste symptom had been a serious distress ; even water was too bitter to be touched. Hungry and with a clean tongue, the patient was unable to dine. A glass of champagne was tried and found to be impossible. This parageusia lasted acutely during five days. The external squint and dilatation of the pupils remained until ten days later, when all pain disappeared. The pupils were smaller, acted slightly to reflected light, and attempts at convergence could be seen. After another ten days the pupils acted to light, and convergence and single vision were possible with effort. The symptoms finally passed away about two months from the onset. There was a history of syphilis twenty years before. The patient was married, with three healthy children. In the treatment, iodide of potassium was pushed to 110 grains daily. Butcher's meat and alcohol were avoided, and a mid-day sleep was obtained. Mr. Wherry thought it probable that the ocular symptoms were due to a syphilitic lesion affecting the nuclei of the third nerve about the aqueduct of Sylvius. The palsy of convergence and dilated pupils without affection of the accommodation pointed to a very minute lesion, and offered interesting clinical evidence of the existence of centres which separated the various functions. In reference to the distressing disturbance of taste, it might be found to be more common in functional disorders, and cast a doubt on the origin of the attack. The patient himself thought it was due to a cerebral hæmorrhage during sexual excitement.

Mr. Spencer Watson inquired if the sense of smell had been affected.

Emphysema of the Conjunctiva.—Mr. Tatham Thompson (Cardiff) read notes of the case of a clergyman, aged about 30. After breakfast on the day he was examined, and whilst blowing his nose rather violently, he felt a sudden "shock," a sensation as of something gradually covering the right eye, and a peculiar "stiffened" feeling in it. He had no pain. On examination, the right eye was found to be displaced downwards two-thirds of an inch, and forwards half an inch. Both lids tensely stretched, purplish in colour, and with superficial veins engorged. Cornea clear, but surrounded by, and partly overhung by, an enormous chemosis of the ocular conjunctiva, of a bluish colour, and almost non-vascular. This "bullous" conjunctiva protruded far between the lids. Crepitation readily elicited on palpation. The conjunctiva was snipped in a radial manner, the air escaping with each snip, the remainder was squeezed out, and the eye returned by steady pressure and massage. All uncomfortable symptoms at once subsided, and vision rapidly returned. The eye was still slightly misplaced down and forwards, and it was found that ten or eleven years before, he had been operated on by Mr. Edgar Browne for exostosis of the orbit, and there had been slight permanent displacement since then. The eye was kept lightly bandaged for twenty-four hours, and forty-eight hours later all traces had disappeared. There had been no recurrence.

Mr. Marcus Gunn asked if the exact position of the exostosis was known.

Eyelashes in the Anterior Chamber.—Mr. Lawford (for Mr. G. D. Johnston, of Vancouver) read notes and showed a sketch of a man who received a wound of the cornea by a piece of wire. Five eyelashes were carried into the anterior chamber, and were subsequently removed by operation, with recovery of a useful eye.

Eyelash in the Anterior Chamber.—Mr. Ernest Clarke reported the case of a boy, aged 13, under his care, who wounded his eye with a knife. An eyelash was carried into the eyeball, the root of the cilium remaining in the corneal wound. It was extracted eight days after the accident.

The President alluded to the case of a sailor who

received a wound from a clasp knife, by which an eyelash was carried into the anterior chamber, where it remained for some months, and gave rise to very slight irritation.

Mr. Critchett mentioned a somewhat similar case.

The Formation and Pathology of Pyramidal and Central Anterior Capsular Cataracts.—Dr. Mules read a paper on this subject, limiting his observations to the class of cases where there was no proof of previous corneal perforation. From a case of his own, where persistent bands of pupillary membrane remained attached by their apices to a central cataract, and by their bases to the larger circle of the iris, he inferred that the central spot was a patch of cretified pupillary membrane, with or without a lymph cone, and he instanced McKenzie's observation of the ease with which many of these spots could be brushed off the capsule, leaving it intact, as confirmatory of his own view; he further pointed out the importance of this explanation in reference to other congenital lenticular opacities.

Mr. Marcus Gunn said that he had suggested a nearly similar explanation for some cases of anterior capsular cataract in a paper he published in the OPTHALMIC REVIEW a few years ago.

Mr. Hartridge mentioned the case of a boy, aged 14, in whom an extensive perforation of the cornea occurred, and where the lens was for some days in contact with the cornea, yet the resulting nebula was very insignificant. It was only in young children that capsular cataract was believed to follow such accidents. He thought perforation of the cornea might leave very little evidence besides damage to the lens. The hypothesis put forward by Dr. Mules would require the persistence of pupillary membrane in many more cases than were at present met with.

Mr. Stephenson said that he met with remains of pupillary membrane very frequently.

Dr. Mules said, in reply, that it had been stated by Wells that perforating ulcer of the cornea in these cases need leave no nebula. The author of the paper had never seen such a case. Those he mentioned showed no trace of a nebula, and gave no history of any inflammatory change. In three the condition was unilateral.

Living and Card Specimens.—Mr. Lawford : (1) Retinal Hæmorrhage and Exudation, with Venous Thrombosis ; (2) Subconjunctival New Growth, ? Gumma. — Mr. R. Williams : Dermoid of Cornea and Conjunctiva. — Mr. Spencer Watson : Dermoid of Cornea and Conjunctiva. — Mr. Ernest Clarke : Absence of Iris, with Opacity of Lens, after Injury. — Mr. Lang : New Growth, ? Sarcoma, at Sclero-Corneal Junction.

THE OPHTHALMOMETER IN PRACTICE.

BY JOHN B. STORY (Dublin).

For some years past the ophthalmometer, as perfected by Javal & Schiötz, has been extensively employed by oculists practising in France and in America, but it has been so very little used in the United Kingdom that the following notes of cases which have occurred in my practice during the past six or eight months may be of interest to some of my ophthalmic colleagues. These notes have been taken purely for my own information, as I was anxious to satisfy myself by personal observation upon the value of the instrument as a help in the ordinary routine of ophthalmic practice, and they do not by any means include all the interesting points which I observed in the various cases, nor indeed all the cases in which I have used the instrument. All cases are included, however, of which I have the notes at hand, and no case has been knowingly omitted. The omissions are simply due to my disinclination to make an exhaustive search through many hundred cases, which would be necessary in consequence of a system of arranging notes of cases which I have adopted for some time past.

The history of the invention of the ophthalmometer and the peculiar modifications adopted in the instrument of Javal & Schiötz are so well known that I need not touch upon either topic. The instrument I employ is the 1889 model of Javal & Schiötz, which was kindly

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procured for me last winter by my friend, Dr. Bull, of Paris.

The only notes of the cases which are submitted for publication are the following:—The initials of the patient for identification, the eye, when known, the amount of astigmatism as measured by the ophthalmometer, and the amount of astigmatism as finally corrected by cylindrical glasses, aided, in many cases, by retinoscopy and the erect ophthalmoscopic image, and, in some, by complete atropinisation.

The refraction is not given, nor the axis of the cylindrical correcting glass, although both are, of course, contained in the notes of the cases, for neither bears directly upon the present issue, which is simply: Does the ophthalmometer afford useful assistance in prescribing astigmatic glasses? The glasses prescribed have generally been those which gave the best results subjectively, the ordinary rule of selecting the strongest convex or the weakest concave, respectively, being followed; and in all cases cylindrical glasses, both higher and lower than those ordered, have been tried before coming to a decision upon the question. In a few cases of amblyopia, and in some very young children, this subjective examination proved unsatisfactory, but, in most of these, the amount of astigmatism was tested by other methods before coming to the conclusion set down, and in many of the other cases, also, different methods were employed. Indeed, in every case in which there was any discrepancy between the ophthalmometrical and the subjective astigmatism, or in which the visual acuity attained was inexplicably low, the eyes were examined by retinoscopy or by the erect ophthalmoscopic image, or by both methods; but I have not thought it necessary to burden this paper with all the details of those examinations. In but few cases was there any important difference between the quantities obtained by the various tests, and the glass finally prescribed takes account of all these factors, no special importance being given to the ophthal-

mometrical astigmatism over that estimated by the other methods. This is not altogether fair to the ophthalmometer, for there are many cases in which it registered an astigmatism of 0.5 D. and where no correcting glass was prescribed, for various reasons, although no manner of doubt could exist that astigmatism was present. This method of record tells against the instrument, but I have preferred to leave it so, as it states a fact, viz., that I ordered or did not order a cylindrical glass of the strength noted in that particular case. It would require too much argument to prove the presence of astigmatism in cases where no glass was prescribed, and add unduly to the length of this paper.

No.	Name.	Age.	Eye, Right or Left	Astigma- tism, as tested by Ophthal- mometer.	Cylin- drical Glasses Ordered	Difference between Ophthalmometrical Astigmatism and Glasses.	Remarks.
1	Miss S. ...	42	R.	3 D.	+3 D.	=	Central nebulae on both corneae. Myopia of 17 D. in both eyes.
2			L.	6.5	+0	+0.5	
3	Miss T. ...	24	R.	1	6	+1	
4			L.	1	0	+1	
5	Richard B. ...	13	R.	0.5	+0.5	=	
6			L.	0.5	+0.75	-0.25	
7	Rita R. ...	20	R.	1	+0.5	+0.5	
8			L.	1	+0.5	+1.5	
9	Mrs. H. ...	?	R.	1.25	+0.75	+0.5	
10			L.	3.25	+3.5	-0.25	
11	Florence S. ...	25	R.	2.5	+1	+1.5	
12			L.	1.75	+1.75	=	
13	Fanny C....	?	R.	1.25	+1	+0.25	
14			L.	1.25	+1	+0.25	
15	Pat. K. ...	22	R.	2	+2	=	
16	Miss J. ...	44	R.	1	0	+1	Simple spherical pres- byopic glasses suit best.
17			L.	0.75	0	+0.75	
18	Nettie O'B. ...	11	R.	0	+1	-1	
19			L.	0	+0.5	-0.5	
20	Henry A. ...	14	R.	1	+0.75	+0.25	
21			L.	1.5	+1	+0.5	
22	Dr. M'C. ...	?	R.	2.5	-2.5	=	
23			L.	2	-1	+1	
24	Pat. D. ...	?	R.	4.5	-4.5	=	
25			L.	1	-0.5	+0.5	
26	Lily M. ...	28	R.	2	-0.5	+1.5	
27			L.	1.5	-0.5	+1	
28	Josephine D. ...	9	R.	0.5	+0.5	=	
29			L.	0.75	+0.5	+0.25	
30	Mrs. D. ...	31	R.	1	-1	=	
31			L.	1.5	-1.5	=	

No.	Name.	Age.	Eye, Right or Left.	Astigma- tism as tested by Ophthal- mometer.	Cylind- rical Glasses Ordered	Difference between Ophthalmo- metrical Astigmatism and Glasses.	Remarks.
32	Fanny D....	?	R.	0	0	=	
33			L.	0	0	=	
34	Mrs. S. ...	?	R.	0	0	=	
35			L.	0	0	=	
36	Dr. C. ...	45	R.	0	0	=	
37			L.	0	0	=	
38	Dr. B. ...	?	R.	4	-4	=	
39			L.	3	-2	+1	
40	Gertrude F. ...	8	R.	0.75	-4	-3.25	
41			L.	1	-4	-3	
42	Annie McG. ..		R.	0.5	+0.5	=	
43			L.	1	+0.75	+0.25	
44	Miss W. ...	?	R.	0	0	=	
45			L.	0	0	=	
46	Sara P. ...	23	R.	1.5	-1.5	=	
47			L.	1.5	-1	+0.5	
48	Bella H. ...	20	R.	3.5	+3	+0.5	The glasses had been ordered by another oculist, and suited perfectly.
49			L.	3	+3	=	
50	Nina A. ...	20	R.	1	+0.75	+0.25	
51			L.	1	+0.75	+0.25	
52	John B. ...	10	R.	1	0	+1	
53			L.	1	0	+1	
54	Edith B. ...	21	R.	1.5	0	+1.5	The As. by ophthalmometer was regular, but no glasses, but +cylinders with axis horizontal improved vision.
55			L.	0.5	0	+0.5	
56	Johanna B. ...	16	R.	0	0	=	
57			L.	0	0	=	
58	Lily W. ...	7	R.	2.5	-2.5	=	
59			L.	3	-2.5	+0.5	
60	Isa B. ...	6	R.	6	+6	=	Marked decentration of both corneæ. By retinoscopy I got As. = 6 D. Right ; = 3.5 D. Left.
61			L.	3	+3.5	-0.5	
62	Charles M'K....	?	R.	3	+2	+1	
63			L.	3	+2	+1	
64	Maria T....	11	R.	4	+4	=	
65			L.	3	+3.5	-0.5	
66	Norris R....	46	R.	0.75	0.75	=	
67			L.	0.5	0.5	=	
68	Marion R. ...	?	R.	1.5	0	+1.5	
69			L.	0.5	0	+0.5	
70	Bertie G....	?	R.	1	+0.75	+0.25	
71			L.	0.5	+0.5	=	
72	Letitia G. ...	22	R.	3	-2.5	+0.5	
73			L.	3	-2.5	+0.5	
74	Mary E. ...	30	R.	2.5	+2.5	=	Both Corneæ hazv from old interstitial keratitis
75			L.	3	+3	=	
76	Mrs. D. ...	60	R.	2.5	+2	+0.5	
77			L.	2	+2	=	An iridectomy had been done on left eye for acute glaucoma.
78	Ethel F. ...	13	R.	0	0	=	
79			L.	0	0	=	
80	Miss G. ...	40	R.	1	0	+1	As. by ophthalmometer regular, but she rather preferred + cylinders with axis horizontal.
81			L.	0.25	0	+0.25	
82	Richard D. ...	19	R.	1.5	+1	+0.5	
83			L.	1.5	+1	+0.5	
84	Miss C. ...	26	R.	1.5	-1.5	=	
85			L.	2	-1.5	+0.5	
86	Mr. H. ...	?	L.	0	0	=	
87	Mr. C. ...	?	R.	0.5	0	+0.5	
88			L.	0.5	0	+0.5	

No.	Name.	Age	Eye, Right or Left.	Astigma- tism as tested by Ophthal- mometer.	Cylin- dri- cal Glasses Ordered	Difference between Ophthal- mo- metrical Astigmatism and Glasses.	Remarks.
89	Miss K. ...	25	R.	0	0	=	
90			L.	0	0	=	
91	Mr. K. ...	50	R.	0.5	0	+0.5	
92			L.	0.5	0	+0.5	
93	May S. ...	19	R.	0	0	=	
94			L.	0	0	=	
95	Mr. W. ...	?	R.	0	0	=	
96	Ada N. ...	30	R.	4	+3	+1	
97			L.	0.5	0	+0.5	
98	Nina M. ...	14	R.	3	+1.5	+1.5	
99			L.	3	+3	=	
100	Mr. M. ...	18	R.	0	0	=	
101			L.	0	0	=	
102	Gerald W. ...	?	R.	3	+1.5	+1.5	
103			L.	3	+3	=	
104	Jas. S. ...	19	R.	0	0	=	
105			L.	0	0	=	
106	Alice L. ...	?	R.	0.75	+0.5	+0.25	
107			L.	0.75	+0.75	=	
108	Gratta McK. ...	16	R.	0.5	0	+0.5	
109			L.	0.5	0	+0.5	
110	George W. ...	12	R.	1	-1	=	
111			L.	1	-0.75	+0.25	
112	Francis F. T. ...	16	R.	4	+4	=	
113			L.	4.5	+5	-0.5	
114	Julia O'B. ...	5	R.	3	+3	=	
115	Master D. ...	15	R.	0.5	0	+0.5	
116			L.	0.5	0	+0.5	
117	Jno. C. ...	?	R.	2	-2	=	
118			L.	1.5	-1.5	=	
119	Mary R. ...	?	L.	1	-1	=	
120	Mrs. P. ...	69	R.	2.5	+2.5	=	
121			L.	1	+1	=	
122	Miss B. ...	?	R.	0.75	+0.25	+0.5	
123			L.	0.5	+0.5	=	
124	Francis McD. ...	?	R.	1	-1	=	
125			L.	1	-1	=	
126	Jas. J. ...	16	R.	3	-2.25	+0.5	
127			L.	4.5	-3.5	+1	
128	Edith, McV. ...	24	R.	1.5	0	+1.5	
129			L.	1.5	0	+1.5	
130	Rev. H. F. ...	?	R.	2	-1	+1	
131			L.	2	-1.5	+0.5	
132	Miss C. ...	?	R.	0	0	=	
133			L.	1	+1	=	
134	Mrs. G. ...	?	R.	1.5	+1	+0.5	
135			L.	1.5	+1	+0.5	
136	Miss W. ...	?	R.	0.75	+0.5	+0.25	
137			L.	0	0	=	
138	Marie B. ...	22	R.	3	-3	=	
139			L.	5	-3	+2	

As. regular by Oph-
thalmometer, but
patient wears—
cylinder ordered else
where, with which he
obtains best vision.

Rt. has +13 D. of H,
and fair vision. Left
amblyopic.

Old interstitial
keratitis and large
iridectomy coloboma
—9 D.

In all 139 eyes were examined. The total amount of astigmatism estimated by the ophthalmometer was 204 D.; astigmatic glasses were prescribed for an astigmatism of 159·5 D. the difference between the ophthalmometrical and the (supposed) correct astigmatism being 44·5 D. or an average error in each eye of 0·32 D. This method of analysis is unreliable, as in some cases the ophthalmometrical astigmatism was higher, and in some lower, than the amount allowed for in the correcting glasses. In 67 of the 139 eyes the ophthalmometrical astigmatism was higher than that of the prescribed glass. The difference amounted to—

0·25 D. in 12 eyes.

0·5 D. in 31 eyes.

0·75 D. in 1 eye.

1·0 D. in 14 eyes.

1·5 D. in 8 eyes.

2·0 D. in 1 eye.

Total 67 eyes.

The total excess of ophthalmometrical astigmatism was 47·25 D. which makes an average error of 0·7 D. in each eye. In the large majority of these 67 eyes (*viz.*, in 43 of them) the difference between the two estimates does not amount to more than 0·5 D.—an excess of objective over subjective astigmatism to which we are well accustomed when making use of other methods of testing. The cases in which the higher amounts of discrepancy occurred were some of them peculiar. No. 139, in which the difference was 2 D. was a case of old interstitial keratitis, with a hazy cornea and large iris coloboma, the result of an iridectomy done in Paris, most probably for high tension. In the other eye of the patient (No. 138) the ophthalmometer and the glass coincided. In Nos. 128 and 129 there were 13 D. of hypermetropia, and one eye was amblyopic, the correct astigmatism for it being only inferred from that of the

other eye, which corresponded to the amblyopic one by all tests employed. In these eyes the difference amounts to 1.5 D.

In Case 54 the difference was 1.5 D. and this case was peculiar in the total astigmatism (estimated subjectively) being in the reverse sense to that of the cornea. The same holds good of Case 80, where the difference only amounted to 1 D. In Nos. 3 and 4, where the difference amounted to 1 D., there were 17 D. of myopia.

In nine eyes the ophthalmometrical astigmatism was less than that found at the final subjective test. The difference amounted to

0.25 D. in 2 eyes.

0.5 D. in 4 eyes.

1.0 D. in 1 eye.

3.0 D. in 2 eyes.

The last two of these eyes (Nos. 40 and 41) belonged to a little girl aged eight, with over 12 D. of myopia, whose eyes were tested by retinoscopy and by the erect image, both with and without atropinisation.

No. 18, in which the difference was 1 D. was also a curious case, in which it is not improbable that some cerebral or ocular mischief may exist. The little girl has not been able to use her eyes for some months, either with or without glasses. She lives in a remote district, and I have not seen her since I prescribed glasses (after atropinisation) some two months ago. In her second eye (No. 19) the difference amounted to 0.5 D. No. 61 exhibits a difference of 0.5, and presented a marked decentration of the cornea, which was also present in the other eye of the same child (No. 60). In this eye the ophthalmometer and retinoscopy (under atropine) coincided. The child's age was six years, so the subjective test was practically worthless. The other four cases show no peculiarities worth noting.

In 62 eyes the ophthalmometer indicated the same

amount of astigmatism as was arrived at finally by the subjective and other tests. In 24 of these eyes there was no astigmatism demonstrable, either objectively or subjectively.

Astigmatism = 0 D. in 24 eyes.

„ < 1 D. in 8 eyes.

„ > 1 and < 2 D. in 12 eyes.

„ > 2 and < 3 D. in 7 eyes.

„ > 3 and < 4 D. in 7 eyes.

„ > 4 D. in 4 eyes.

In 26 eyes there was ophthalmometrically no astigmatism, and in but two of these could any other evidence of astigmatism be discovered, viz., in Nos. 18 and 19, the eyes of the little girl mentioned above, in whose case some pathological condition other than astigmatism is probably present.

In conclusion, I would venture to assert that any oculist who uses the instrument for a month in ordinary routine practice will be more strongly impressed by its utility than he can be by reading the notes of other men's observations. The value I set upon this instrument is far higher than the bare notes of the above cases would justify me in giving it; the most, perhaps, that my figures allow me to assert is, that when the ophthalmometer records no astigmatism, none will be found by any other test, and that when an ophthalmometrical astigmatism of a given amount is present, cylindrical glasses will probably be required some 0.5 D. weaker than those indicated by the instrument. But these statements do not touch upon the most important advantage of all possessed by the instrument—the saving of time. The absence of astigmatism or its amount when present are ascertained with such rapidity by the ophthalmometer that the time spent in observation is infinitesimal, and if other methods of testing have to be subsequently employed, time is still saved on the whole, for the ophthalmometrical data form a starting

point which considerably expedites an examination by retinoscopy, or even by the erect image. To all this must be added that in 62 eyes out of 139 of my observations, *i.e.*, in more than 44 per cent. of the cases, no further objective test was necessary

I am aware that there is nothing novel in these observations of mine, and that the valuable papers which have been published on the continent, and which have been issued in a collected form by Javal (*Mémoires d'Ophtalmométrie*, 1891) cover all the ground which I have occupied; these notes are simply brought forward in support of my own belief that the ophthalmometer is an instrument of such utility that every oculist and ophthalmic hospital should be possessed of this important aid to the rapid and correct estimation of astigmatism.

H. MAGNUS (Breslau). Experimental Study of the Nutrition of the Lens and the Formation of Cataract. *Von Graefe's Archiv.*, Vol. XXXVI., Part IV., p. 150. 1890.

The experiments upon which this paper is based were undertaken with the object of minutely studying the changes in the crystalline lens which may be artificially produced in animals by feeding them with naphthalin or with large doses of salt or sugar, and in the hope of obtaining thereby some fresh light on the causation of cataract in man. The greater part of the paper is devoted to a minute description of the cataractous changes produced in rabbits by naphthalin. The following are the salient points:—

The first phase in the production of naphthalin-cataract is the appearance of transparent streaks or striæ extending in a radial direction from the equator towards the poles of the lens. These are characterised by the readiness with

which they appear and disappear during slight movements of the ophthalmoscope while the eye is under examination. They are due to minute depressions in the lens-surface. If the lens be extracted in this stage and examined in the fresh condition, it presents a series of depressions running transversely around the equator, and extending a short distance on the anterior and posterior surfaces. Their depth varies considerably. In some cases they are so deep that even on ophthalmoscopic examination of the living eye a space is visible between the indented lens-margin and the ciliary body. The capsule follows the curves in the lens-substance, and when it is removed, together with the most superficial layers of fibres, the incurving of the fibre-layers is found to extend deeply into the lens-substance. The lens-fibres do not, however, in this stage lose their transparency.

These equatorial radial depressions in the lens, and the resulting transparent streaks visible with the ophthalmoscope, are evidently the expression of shrinking of the lens-substance. Similar changes occur when the lens shrinks through loss of water, either through the action of evaporation, or when the lens is treated with nitric acid or glycerine.

Although it would be unsafe to assume an exact identity between the two, it is interesting to note that cataract in the human lens sometimes begins with the appearance of transparent streaks much resembling those here described as the result of naphthalin.

The second phase is the occurrence of actual opacity in the lens. The opacity makes its first appearance at the equator, or rather in two zones, one immediately in front of, and the other immediately behind, the equator; the equator itself remaining at first quite transparent. The posterior of these two zones shows the more intense opacity. The depressions in the lens-surface, already described, appear as darker streaks in the zone of opacity, following the general direction of the lens-fibres.

The opaque zone increases quickly in breadth and in intensity, but for a time often presents a certain number of minute roundish spots, which remain quite transparent and transmit the clear reflex of the fundus. These trans-

parent spots are mostly of one size, and are situated between two adjacent depressions in the lens-surface; a fine dark line, marking the junction of the two, being sometimes visible across the transparent spot. An anatomical explanation of this appearance is not forthcoming.

The opaque zone in the posterior cortex extends more rapidly, and loses its striate appearance sooner than that in the anterior cortex; the comparative narrowness of the latter permits the deeper changes to be accurately studied.

Microscopic examination of the freshly-extracted lens resolves the diffuse opacity into minute granules arranged in rows which correspond with the direction of the lens-fibres, each fibre appearing as though broken up into a series of granules.

The third phase in the process is that of restitution. The opacity disappears spontaneously, and this occurs even in cases in which the whole posterior cortex has become opaque. This remarkable change appears to be due, not to any true absorption of opaque substance, but to a restoration of the shrunken fibres to a condition of transparency. A lens rendered cataractous by the action of naphthalin quickly recovers its transparency if extracted and laid in distilled water. The same is true of cataracts artificially produced by salt or sugar. Under the microscope the return of transparency can be seen to depend on a disappearance of the granular condition of the fibres and of the spaces between them, the fibres recovering their normal homogeneous appearance. That the recovery of transparency in the living eye is due to the same process appears from the fact that a lens which has thus recovered shows, under the microscope, no deformity of any kind.

With regard to the pathogenesis of naphthalin-cataract, it is certain, in the first place, that it has no direct connection with the changes which the same drug produces in the retina. Hyperæmia of the ciliary body appears to play an important part in the process. It is never absent. Thus, an examination of one eye of a rabbit before the naphthalin is given, and of the other eye after the naphthalin has taken effect, invariably reveals hyperæmia of the ciliary body in the latter.

The changes in the eye cannot be safely attributed to an alteration in the amount of water contained in the blood, for a careful comparison of the blood of healthy rabbits with that of rabbits treated with naphthalin shows only unimportant differences in the proportion of water.

Chemical examination of a series of naphthalin-cataracts appears to show that naphthalin was present in very minute quantities in the lenses.

Magnus describes a further series of experiments on the artificial production of cataract in dogs and cats by the introduction of large doses of salt into the stomach. By the use of sufficiently large doses cataract is produced in every instance. As in the case of naphthalin-cataract, the opacity begins in a zone situated immediately behind the equator, and spreads thence over the whole of the posterior cortex, leaving only a tripartite figure at the pole transparent. Only the most superficial layers are affected. An anterior zone of opacity is not usually discoverable, though the opacity may extend from the posterior zone around the equator for a short distance into the anterior cortex. In some cases transparent streaks proceeding from the equator towards the pole, as in the naphthalin-cataracts, are observable.

In like manner a series of experiments was made with grape-sugar. The artificial production of cataract by this means is less easy and regular than with naphthalin or salt, but success was obtained in a sufficient number of cases to show that the starting-point of the opacity is, as in the naphthalin and salt experiments, a zone lying immediately behind the equator.

From these observations, many of which are merely confirmatory of the results obtained by previous experimenters, Magnus draws the following conclusions concerning the nutrition of the normal lens :—

(1). The nutritive processes are more active in the posterior than in the anterior half of the lens. This conclusion accords with the observations of Deutschmann, who, in rabbits killed three hours after receiving a dose of iodide of potassium, found the iodide in the lens chiefly in the posterior sub-capsular layers. It agrees also with the clinical.

observations of Fuchs, who has noted that it is only in the posterior cortex that any considerable clearing up of traumatic opacity ever takes place.

(2). The chief nutrient stream enters the lens in the zone which lies parallel with, and immediately behind, the equator.

(3). A less important nutrient stream enters the lens in the zone lying immediately in front of the equator.

(4). The posterior pole also receives a nutrient stream, which is, however, of smaller amount than those entering at the equatorial zones.

(5). The anterior pole appears to receive no nutrient stream from without.

(6). The equator itself receives no direct stream, but depends for its nutrition on the zones lying immediately before and behind it.

The paper ends with a discussion of these experimental results in relation to the pathology of senile cataract in man. According to the author's own clinical observations, published in an earlier paper, senile cataract begins in the very large majority of cases—nearly 93 per cent.—by the appearance of cortical opacities close to the equator and immediately beneath the capsule, just as in the artificial process here described. This similarity strongly favours the idea that in the senile, as in the artificial process, the essential cause is a disturbance of nutrition at the point where the nutrient stream normally enters the lens. But, in the case of senile cataract, it is not necessary to seek for this nutritive disturbance in any chemical change in the fluid which nourishes the lens; it may lie rather in a circulatory disturbance. With the advance of age the lens-substance becomes harder, and this, in all probability, offers an increasing resistance to the movement of the nutrient fluid through it, and, seeing that the fluid normally enters the lens in the region of the equator, it is natural that the obstruction should tend to show itself first by pathological changes in this region.

P. S.

QUERENGHI (Milan). A Clinical Contribution to the Physiology of the Ophthalmic Ganglion. *Archives d'Ophthalmologie*, May—June, 1891.

The author records two cases which he believes throw some light upon the functions of the ophthalmic or lenticular ganglion. 1. C. B., æt. 22, received a blow in the region of the left eyebrow in December, 1888; he was slightly stunned, but for two days was able to go on with his usual occupation. On the third day he noticed a painful swelling in the left ocular region, which increased until it nearly obstructed the aperture of the eye, but his vision was still quite normal. On the fourth day after the blow the left eye suddenly became nearly blind, and this lasted for about twenty days, when he began to have perception of light, and at the same time the swelling commenced to subside. He then, for a short time, had double vision, and noticed, when he looked in the glass, that his left eye was turned outwards; by this time the swelling and discoloration of the skin had almost disappeared, the diplopia ceased, but the amblyopia remained. In August, 1889, he consulted Querenghi for the dimness of vision of the left eye, when the following condition was made out:—On the upper and outer border of the left orbit there was felt a hard, immobile, uniform swelling, which was continued under the roof of the orbit; the pupils were regular, and, together, reacted equally to light and on convergence; the ocular movements were natural on the two sides. If the right eye was closed, and he was made to look at a distant object, the left pupil rapidly dilated to almost six millimetres in diameter; but if one threw a light into the left eye the pupil remained fixed; it likewise remained immobile to accommodation, but contracted with movements of convergence. Although the tactile sensibility of the left cornea and conjunctiva was present, disagreeable impressions were not perceived. Ophthalmoscopically there was noticed white atrophy of the left optic disc, with small arteries and full veins; the margins of the disc were regular. Right vision = 1 : left

vision = $\frac{1}{8}$, and, for distance, was not improved by glasses. But with + 5 D. he was able to read ordinary print at 20 cm., "which gives $V = \frac{1}{4}$." The left visual field was restricted in all diameters.

The explanation of the principal physical sign was easy :— Atrophy of the left optic disc from the antecedent retro-bulbar hæmorrhage. The causation of the other signs forms the object of the communication. The injury to the left eyebrow caused a fracture of the roof of the orbit and rupture of some blood-vessels. The blood was diffused through the retro-ocular fat and compressed the optic nerve. Absorption followed, to some extent, with organisation of the exuded material, and the ophthalmic or lenticular ganglion, which lies in the cellular tissue of the orbit, was unable to recover from the effects of the compression which it had undergone.

2. A second case is recorded which resembles the above in many particulars. R. P., æt. 45, on the 29th of January, 1890, received a severe blow upon the head, which resulted in a comminuted fracture implicating the superior maxillary bone and the bones of the nose. There was a large swelling of extravasated blood in the left ocular region. On the tenth day he was delirious, and a few days later pus escaped from a swelling under the internal angle of the left orbit. Shortly after this there was observed right-sided ptosis and bilateral dimness of vision, both of which, however, gradually disappeared. In April, as his sight was bad and he had double vision, he consulted Dr. Querenghi, who observed atrophy of the left optic disc and the following other facts: There was considerable facial deformity, as a result of depression of the zygomatic region. To daylight the pupils contracted well, but in a feeble light they dilated, the left slightly more than the right. The right pupil reacted in a normal way when the left eye was covered; but if the right eye was covered, the left pupil dilated considerably. In accommodation this pupil contracted very slightly, but reacted well with convergence. It did not contract when the rays from a mirror were thrown into the eye in the dark room. His vision was as

follows :—R. V. = 1 ; L. V. = $\frac{1}{20}$, but with + 4 D. = $\frac{1}{3}$. With + 7 D. he obtained vision for near objects = 1.

The left visual field showed a small hollowing out on its external part, otherwise it was nearly normal. The sensibility of the cornea and conjunctiva presented no abnormality. Except for paresis of the right superior and right internal recti muscles, the right eye was quite normal.

The facts of this case, then, which indicate a destruction of the function of the left lenticular ganglion are : dilatation of the pupil and its relative immobility to light and accommodation, when the right eye is not associated in action with it. The difference between the two cases is only one of degree. The cause is probably the same in both, a retrobulbar hæmorrhage compressing the optic nerve, and followed by more or less destruction of the lenticular ganglion.

The author now deals with the functions of this ganglion and its anatomical connections. It is unnecessary to follow him through a series of elementary facts ; it is sufficient to state briefly that the nerves, which supply the eyeball, are the long and short ciliary nerves ; the former, arising directly from the ophthalmic division of the fifth cranial nerve, are mainly sensory in function ; the latter, issuing from the ophthalmic ganglion, supply motor filaments to the iris and ciliary muscles.

The anatomical and physiological facts are then brought to bear upon the clinical data of the cases under discussion, and the conclusion is formed that the functions of the lenticular ganglion are in abeyance, and for these reasons :—

(1). Because through this ganglion the fibres which excite the muscle of accommodation pass.

(2). Because the ganglion is traversed by the pupil-constricting fibres, which subserve the reflexes of the same eye.

(3). Because it presides to some extent over the sensibility of the cornea.

(4). The pupil-constricting fibres which subserve the light reflex of the opposite eye and the movements of convergence come directly from the central organs without

the intervention of the ganglion ; they probably come by the long ciliary nerves.

The subject which the author treats here is one of great interest, but of considerable difficulty : the facts of the cases which he has brought forward to define the functions of the ophthalmic ganglion admit, we think, of a wider significance. We believe that the impaired functions of the optic nerve itself will sufficiently account for the paralysis of the direct light reflex, in the left or injured eyes, and for the maintenance of the consensual light reflex and associated movement of the pupil with convergence. Destruction of one limb of the reflex arc (the optic nerve) in the injured eyes is sufficient to cause the condition described ; while destruction of both limbs, viz., the optic nerve and the ciliary branches of the third nerve, as the author believes is the case, would, we submit, effectually arrest both consensual and associated movements. In order to overcome this difficulty the statement is made that the fibres subserving consensual movements pass to the iris and ciliary muscles by the long ciliary nerves, an assumption for which we think there is neither anatomical nor experimental foundation. We further find it difficult to understand how the lenticular ganglion, which is a small body securely placed in a large mass of retrobulbar fat, could be subjected to so severe a compression as to have its functions completely destroyed. In the first case, where the imperfect vision and restriction of the field indicate very complete destruction of the function of the optic nerve, the loss of the light reflex is complete ; but in the second, where the facts point to less abrogation of the functions of the nerve, the paralysis is considerably less in amount.

The first case, however, presents two features which were not observed in the second, viz. : paralysis of accommodation and a disturbance of the corneal sensibility. These cannot be explained on the hypothesis which we have put forward. As regards the corneal sensibility, we believe that, if the functions of the lenticular ganglion had been so completely destroyed, the anæsthesia of the cornea would have been more or less complete. The paralysis of accommodation,

which in this case seems to have been present, although we do not think the data on the point are sufficiently precise, involves the separation of the efferent tracts for consensual movements of the pupil and its contraction with convergence from those of accommodation, which is difficult to explain by the light of our present knowledge.

In support of our contention that the state of the optic nerve will account for all the facts of the second case and the majority of those of the first, we may briefly refer to the following case, which Mr. Marcus Gunn has kindly permitted us to make use of:—

W. O., aet. 50, who is an out-patient at Moorfields Hospital, has chronic renal disease and a right-sided hemiplegia of two and a-half years' duration. Thirteen months ago (May, 1890) he suddenly lost the sight of the right eye, which, on examination, presented the following features:—Complete blindness, the patient being unable to distinguish light from darkness; on ophthalmoscopic examination, the right fundus was found to be perfectly normal; the right pupil was inactive to light, but contracted well with convergence. At the present time the right eye presents the following condition:— $R.V.=\frac{6}{24}$. + 1 D.= $\frac{6}{12}$. The optic disc is white, and the arteries and veins are relatively small. The visual field is contracted to about half the normal size in all diameters. The pupils, when the patient looks at a distant object, measure 2.75 mm. When the left eye is closed, the right pupil reacts slightly and sluggishly to light and to accommodation, but well with convergence; but when the light is allowed to fall on the left eye, the right pupil contracts briskly and to an equal extent with the left. The reaction of the left pupil to light and accommodation is active, and $L.V.=\frac{6}{6}$.

Such physical signs are characteristic of an interruption to the course of the afferent fibres alone, which in this case is probably a retrobulbar hæmorrhage, partially destroying the right optic nerve. As there is no reason to believe that the functions of the ophthalmic ganglion have been interfered with in this case, it forms a not inapt comparison with the two recorded above by Dr. Quereghni.

W. ALDREN TURNER.

A. GUILLEMAIN. (Paris). A Study of Abscesses of the Frontal Sinus, chiefly with regard to their Orbital Complications, Diagnosis and Treatment.—*Archiv. d'Ophtal.* Jan.—Feb.—Mar.—Apr., 1891.

The author, who is Anatomical Assistant at the Faculty of Medicine, Paris, first describes the anatomy of the frontal sinuses. These cavities are generally two in number, separated by a median partition, which may be deviated to the right or left; occasionally three or four partitions have been observed. The dimensions are variable, generally the sinuses become more developed with increasing age, and are larger in men than in women. The average extent in man is 3 cm. in all dimensions; in woman the vertical height is about 2 cm. They sometimes extend much further, and have been seen reaching upwards to the frontal eminences, and outwards to the external angular process. On the other hand there are other rarer cases in which the sinuses are absent. Their form is irregular, but they consist of three walls; a postero-superior or cranial, a postero-inferior or orbital, and an anterior. The two former consist only of a thin lamina of compact tissue, while the latter is notably thicker and contains a diploë.

Each frontal sinus opens below into the infundibulum of the ethmoid by a canal hollowed out in the anterior cells of that bone; to this opening the name of *frontal canal* is given, the name of infundibulum being reserved for the wider part by which it opens into the middle meatus. The average length of the frontal canal is 15 mm. in man, 10 mm. in woman; it is cylindrical in shape, but somewhat flattened transversely; its diameter varies from 2 to 3 mm.; its direction is obliquely from above downwards, from without inwards, and from before backwards. The upper opening is placed at some distance from the median partition on each side, the lower opening ends by means of the infundibulum in the middle meatus of the nose.

The cavity of the sinus is lined with a thin, smooth

mucous membrane, not firmly attached to the bone, in which two layers can be recognised : this is well supplied with nerves, which accounts for its lively sensibility. It appears also to be the seat of special sensibility in relation with the olfactory organ, since nervous apparatus similar to that in the pituitary membrane can be seen in it.

Abscess or empyæma of the frontal sinuses is an affection of adults, and occurs most frequently between the ages of 25 and 30 ; it is unknown in the infant, on account of the non-development of these cavities. It is slightly more frequent in man than in woman, probably because the infundibulum is wider, and in more direct communication with the exterior, and in consequence more accessible to infective agents. The sinus on the left side is more often affected than that on the right ; both sides are very rarely attacked at once ; the septum, however, is frequently deviated, and an abscess in the larger sinus will give rise to the impression that both sinuses are affected.

As to the causation of suppuration in the frontal sinuses the author excludes syphilis and tubercle, which may give rise to osteoperiostitis, and to secondary filling of the sinuses with pus, but which do not cause primary abscess. Erysipelas has been seen to precede abscess in the sinus by some months, and may have travelled to the sinus by way of the nasal mucous membrane and the infundibulum. The sinuses have suppurated during convalescence from scarlatina and typhoid fever, and lately influenza has been reported as a cause. The more frequent causes are injury, foreign bodies, such as bullets, the larvæ of insects, and inflammatory lesions ; acute coryza, or the chronic form ending in ozæna : the outbreak of abscess has been preceded by polypi of the nasal fossæ.

Of course all these are only predisposing causes ; for suppuration to take place here, as in every other organ, penetration and proliferation of pyogenic organisms are necessary ; once invaded by these organisms, the mucous membrane swells, the opening of the infundibulum is obliterated, and the pus accumulates in the sinus.

Post-mortem examinations have revealed a varying amount of expansion of the bone, and destruction of the

surrounding parts. The amount of pus which escapes on trephining varies from a few drops to several drachms.

This pus has special properties due to its mixture with mucus ; it is yellow, and sometimes almost green, like bile, and intimately mixed with the mucus, so that there results a gelatinous semi-solid viscous mass, which can only be removed with difficulty. It has a most fetid odour.

When the cavity is emptied, the mucous membrane can be seen thickened and fungating, and forming at the opening into the infundilulum a circular cushion which obliterates or contracts its cavity. If the inflammatory processes have resulted in ulceration of the mucous membrane, the underlying bone dies, and a sequestrum is formed. Perforation of the walls of the sinus may take place ; this most frequently occurs downwards at the expense of the thin lamina which separates it from the orbit, but perforation of the cranial cavity may take place, and there may only be the dura mater or thickened arachnoid separating the frontal lobe from the abscess.

The onset of abscess in the frontal sinus is sometimes attended by symptoms of general fever, with the local signs of acute inflammation over the seat of the sinus, but this is exceptional. The affection is usually a chronic one ; for some years there may be a purulent discharge from the nostril before obliteration of the infundibulum causes retention. This may show itself only by the formation of a small tumour at the inner angle of the orbit, or may produce symptoms of orbital compression, exophthalmos, strabismus, or diplopia.

Pain is not always present or may exist at first and disappear before the abscess shows itself ; it is most intense at the point of emergence of the frontal nerves, and in the globe of the eye, radiating thence over the forehead and temple. It is frequently intermittent, the attacks being accompanied by vomiting and even delirium, and may be brought on by certain movements of the head and eyes. Local signs must be looked for in the bulging of one of the walls, of which the orbital one, the least resistant, will probably yield first ; the anterior wall very rarely gives way, but it may be thickened owing to a periostitis of the frontal

bone. In those cases in which the cranial wall has yielded, weakening of sensibility and paralysis with coma have supervened. When the orbital wall has become perforated, the pus escapes into the orbit, and gives rise to an abscess, seated generally at the inner side of the orbit, but it may be more external, and has been seen in the region of the malar bone.

Sometimes the inflammation in the sinus is communicated through the bone to the subcutaneous tissues, forming an abscess there, which is not continuous with the empyæma in the sinus; in these cases evacuation of the abscess does not lead to a relief of the symptoms.

When an opening into the sinus is once established, there is a great tendency to the permanence of the fistula, the rigid walls of the cavity being unable to approach one another. The treatment which the author advises as the result of his experience of cases, and of certain experiments made with M. Panas on the dead subject, is as follows:—

If the walls are intact, the sinus must be trephined and drained, either through the orbit, or by the fronto-nasal canal. If by the orbit the incision is made to the inner side of the orbital arch, just below the eyebrow; a small plate of bone is removed; the cavity is then evacuated and drained. If it be decided to drain by the fronto-nasal canal, an incision 35mm. long immediately below the brow joins at a rounded angle a median vertical incision 25mm. high from the root of the nose. Everything, including the periosteum, is turned back; by this means the supra-trochlear nerve will escape injury, and the resulting scar will be hidden by the folds of skin. After opening the sinus by a trephine, the long opening must be enlarged upwards for about half a centimetre to allow the catheter to be used. This instrument, of which a full-sized illustration is given, was found to be most suited to the curvature of the canal, after a series of experiments made on the dead subject; it consists of almost a semicircle of elastic metal, ending on one side in a handle, and on the other in a probe point. It is passed very carefully through the infundibulum, so as not to make false passages, and out through the middle meatus and nostril in front; a drainage tube is attached to

its end by a thread ; the instrument is withdrawn and the drainage tube carried with it through the infundibulum into the sinus. The integument is closed except where the tube passes out ; and the cavity is daily washed out through the tube. The author has had greater success with the latter form of treatment than with any other, but he admits that even then the process of cure may take several months.

W. T. HOLMES SPICER.

PERCIVAL (Newcastle-on-Tyne). **The Action of Prismo-spheres and Decentred Lenses.** *Reprint from Archives of Ophthalmology, Vol. XX., No. 2, 1891.*

The author believes that the frequent failure of prisms or prismo-spheres to relieve the symptoms arising from slight defects of the ocular muscles, is partly to be explained by the want of precise knowledge concerning the action of prisms in combination with spherical lenses, either convex or concave. Having shown that the effect of a simple prism upon rays of light is not the same as that of a prismo-sphere, he proceeds to discuss the action of the latter when used in spectacles, upon the direction of the ocular fixation lines ; in doing so the prismo-sphere is considered as a decentred spherical lens, and a mathematical formula is worked out which "enables one to determine the degree of ocular deviation produced by a decentred lens, and conversely to what extent a lens should be decentred in order to induce in the ocular fixation lines a given direction."

A series of tables is appended, giving for different lenses, convex and concave, the amount of decentration (in millimetres) necessary, and the prismatic equivalents of these decentred lenses, *i.e.*, the deviating power of the decentred lens expressed in terms of a simple prism. In using these tables it is necessary that the convergence power should be carefully tested, and the author suggests the following procedure for this purpose ;—After the examination of the

refraction and accommodation, glasses should be given, with which the near point of accommodation (pa) becomes $\frac{1}{3}$ m. The strongest adducting prisms compatible with single vision must now be found. The position of the near point of convergence (pc) can then be determined by a reference to the tables, or by means of a simple calculation. The paper contains several diagrams illustrating the action of prisms and prisino-spheres upon rays of light, and their effect in altering the direction of the ocular fixation lines.

J. B. L.

GILLET de GRANDMONT. (Paris.) A New Operation for Congenital Ptosis.—*Recueil d'Ophthalmol.*, May, 1891.

In a paper read before the French Ophthalmological Congress, the writer described an operation he had recently adopted for the treatment of congenital ptosis, and with which he had obtained satisfactory results.

In unilateral ptosis, before operating, measurements should be made from the eyebrow to the free border of the lid, when the patient fixes an object on the level of his eyes; the difference in the measurement on the two sides will be a guide to the amount of effect required.

The operation is as follows :—

The lid is secured in a Snellen's clamp, and an incision about 2.5 cm. in length made parallel to the ciliary border, at a distance of 2 to 4 mm. from it. The skin is dissected up along the cut edges, the orbicularis muscle removed in the extent of the incision, and the tarsus exposed from near the ciliary border to the tendon of the levator palpebræ. An incision is then made through the whole thickness of the tarsus, parallel with the original skin wound, and about 2 cm. in length. The ends of this cut are joined by a curved incision, the height of which will depend upon the amount of effect desired. This curved incision also is car-

ried through the whole thickness of the lid, and the piece of lid thus separated is entirely removed, exposing the clamp beneath. The description does not state definitely whether the conjunctiva is removed or not, but the context leads to the supposition that it is cut through and taken away with the other structures. The last step in the operation is to suture, by means of fine catgut, the upper and lower edges of the wound in the tarsus ; these stitches need not be removed ; no skin sutures are necessary. The after-treatment required is of the simplest kind ; some œdema of the lid usually supervenes, and remains for one or two weeks, during which time the result of the operation cannot be estimated. The cicatrix of the skin wound is subsequently scarcely visible.

J. B. L.

CHARLES A. OLIVER (Philadelphia). A Case of Sarcoma of the Genu of the Corpus Callosum presenting symptoms of profound Hysteria : with Autopsy. (*Reprinted from Univ. Med. Magazine, April, 1891.*)

The case was that of a woman æt. 43, seen first by Dr. Oliver in March, 1890. The patient was pale and emaciated, and of exceedingly emotional temperament : she suffered from retroversion of the uterus, dating from the birth of her last child in 1886. She was the mother of four healthy children, and her own family history was good. The first symptoms of her illness began in the early summer of 1887, while nursing her child, and showed themselves in increasing lassitude and unwillingness to move, although when once fairly roused she could be as active as other people. In the autumn of the same year, while her general symptoms had somewhat improved, the sight of her left eye began to fail, and she was compelled to give up any continuous near work. In the spring of 1888 her sense of

smell became impaired and was finally lost in the following year. Taste was the next sense affected, and this, although not absolutely lost, was dulled to such a degree that all articles of diet, in order to be palatable, had to be very highly seasoned. No auditory symptoms were complained of, but later, in the course of her illness, a manifest defect of hearing was detected. By December, 1889, her lassitude had increased so much that she remained almost constantly in bed. In January, 1890, the vision of her right eye began to fail; and in February of the same year, after a severe attack of flooding, evidence of mental aberration was for the first time definitely established. She had constant visual hallucinations, followed some time later by delusions, more especially tactile in nature. The condition of the eyes in March, 1890 (*i.e.*, when first seen by Dr. Oliver), was as follows:—Central vision for form in the right eye = $\frac{1}{50}$, and could not be improved. L. V. = perception of light only in a small area to the nasal side of the field. No accommodation in either eye. Both pupils were round, but the left was much the larger of the two. The left iris was absolutely immobile to the strongest light stimulus projected from all meridians, except in a small area to the nasal side, while the right pupil responded sluggishly to light thrown in either from the nasal or temporal side. The external ocular muscles acted well both in associated and disassociated movements. Fields for white and colours, very carefully taken for the right eye showed the characteristic early fatigue supposed to be typical of hysteria. There was not much to note in the condition of the fundi; in the right, the media were clear, the disc slightly grey, surrounded by a complete scleral ring; the larger veins were somewhat tortuous, but the vessels otherwise normal. In the left eye the margin of the disc was veiled, but not hidden, by a delicate retinal striation; the retina throughout was slightly swollen and apparently œdematous; vessels as in other eye. Refraction = $\cdot 5$ D. of hypermetropia in each. On the 15th of April she was again examined, with the same result as before, except that her right vision was momentarily increased to $\frac{1}{20}$, but immediately afterwards again fell to $\frac{1}{50}$. Her sense of hearing at this time was

found to be twice as good on the right side as on the left. No evidence of cranial tenderness could be discovered, and there was nothing to indicate the presence of word blindness, word deafness, or loss of the faculty of language in any of its forms. No interference with motor functions could be made out. Except for occasional slight improvement and relapses, her condition remained more or less the same until September, when she became weaker, and from this time steadily got worse, finally sinking into a state of coma on December 14th, which, with one brief intermission, persisted till she died on the 21st. The *post-mortem* examination was made forty-eight hours after death, but was, by order of the friends, limited to opening the calvarium. The skull-cap was of medium thickness, and there were no adhesions of dura mater to it: the superior longitudinal sinus was nearly empty, the membranes slightly congested, but otherwise not abnormal. The dura mater was found to be firmly adherent to the crista galli, and a roundish mass could be felt on both sides of this prominence, extending to the corpus callosum. This was removed without difficulty except from the body of the sphenoid bone, to which it had become closely attached. The shape of the tumour was that of a half-sphere hollowed in the centre: it measured antero-posteriorly $5\frac{1}{2}$ cm. transversely 6 cm., and its greatest vertical depth was $2\frac{1}{4}$ cm. "In its anterior and inferior portions it is incompletely divided by a fissure into two nearly equal parts, and turns in upon itself like the rudiment of the knee of the corpus callosum. To the left of the median line extending posteriorly, and lying beneath the optic chiasma, there is a small rounded projection. The optic nerves rounding this projection follow the convexity of the tumour to their entrance into the optic foramina." The greatest bulk of the growth was to the left of the middle line; it seemed to spring from the genu of the corpus callosum, pushing the uncinate gyri far apart, and causing great pressure on the temporal lobes. Both olfactory lobes were intact. The entire brain was carefully examined, but, beyond the single tumour described, no gross alteration was observed. The posterior thirds of the globes, both optic nerves, the chiasma and part of the

optic tracts, were removed for further examination. In a series of more than 50 sections, the microscope failed to detect any change beyond a slightly œdematous condition of the left optic nerve and disc, and a small area of surrounding retina. Sections of the intracranial growth itself showed it to be a spindle-celled sarcoma.

N. M. ML.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, JUNE 11TH, 1891.

HENRY POWER, M.B., President, in the Chair.

The Treatment of Squint by Advancement of the Recti Muscles.—Dr. Adolf Bronner (Bradford) read a paper based upon the records of fifty cases of strabismus treated by advancement of one of the recti muscles according to the method advocated by Schweigger. In most of the cases cocaine was the only anæsthetic employed. Dr. Bronner drew attention to the large number of cases of convergent strabismus, in which the external rectus was thin and atrophic. He thought it was of the greatest importance that the size and condition of the muscle should be ascertained as nearly as possible before the advancement was performed. In many cases tenotomy of the antagonistic muscle was necessary and in some tenotomy or advancement had to be performed upon the muscles of the fellow eye. In cases of divergent strabismus tenotomy of the external and advancement of the internal rectus were necessary, and the immediate effect of the operation should be slight convergence. In no case should the same muscle be tenotomised more than once. The author thought that advancement of the muscle was the best

operation in all cases in which the squinting eye was amblyopic, and in which the angle of deviation measured more than 30° . The advantages of advancement of a muscle over an ordinary tenotomy were that the danger of a subsequent strabismus in the opposite direction was much less, and that the operation aimed at strengthening a weak muscle instead of weakening a muscle previously strong.

The President said that his experience of tenotomy had been satisfactory, and that he preferred the simpler operation in the majority of cases. He had seen but few undesirable results. The cases which he found most difficult to deal with were those of very slight squint with extremely troublesome diplopia.

Mr. Juler thought that Schweigger's plan of tying in two sutures would be likely to set up a good deal of irritation. He preferred an operation which was a modification of Critchett's, and with which he had had good results. He thought advancement of muscles in cases of strabismus was a method of treatment not fully appreciated by many English surgeons.

Mr. Eales (Birmingham) described the method of operating which he adopted ; he frequently performed advancement of the recti muscles in strabismus cases.

Mr. Edgar Browne (Liverpool), after referring to the older methods of treatment employed in this country years ago, described the plan he himself adopted. He had found that the operation was simplified by introducing the threads in the reverse way to that usually done, that is, to attach the thread to the conjunctiva or sclera at the point of fixation first, and subsequently to the tendon or muscle. He emphasised the importance of fully correcting any astigmatism in cases of strabismus.

Mr. Jessop had found that advancement of a rectus muscle without tenotomy of its opponent was of little value. He preferred to do the tenotomy by Landolt's method before bringing forward the weakened muscle.

Mr. Cowell said that in the operation described he recognised an old friend under a new name. The operation used to be known as readjustment. He had treated many cases of secondary divergent strabismus by this method, occasion-

ally converging the eyes during the first day or two after the operation by a suture passed through the skin of the bridge of the nose.

Mr. Lang pointed out that the terms readjustment and advancement of a muscle had different meanings. He thought it important in this treatment to endeavour to restore binocular vision at the time of the operation.

Mr. Doyne (Oxford) and Mr. Story (Dublin) thought that binocular vision after operations for strabismus was an exceptional result, and one which few operators seriously sought to obtain.

Dr. Bronner, in reply, affirmed that Schweigger's method of operating maintained the normal lateral movement of the globe. He had long given up thinking about the restoration of binocular vision in cases of strabismus.

Detachment of the Choroid.—Mr. Story (Dublin) read notes of a case of this rare affection in a man, aged 29, who had been for more than two years under his care. The patient was kicked by a horse on his right eyebrow and nose in childhood, and some years later was struck by a stone at the outer angle of the left orbit. These injuries seemed to have no connection with the loss of sight, which occurred rather gradually in his right eye at the age of 20, and in his left about a year before coming to hospital. During the two years he has been under observation, no important changes have occurred in the state of the eye; slight variations have taken place in the extent of the detachment, and vision has remained pretty constant at fingers at 2 metres in the right and fingers at 4 metres in the left eye. Tension normal, or at times slightly subnormal; media clear except for a nebula on the left cornea, and opacities in both vitreous chambers; discs slightly hazy, and marked perivascular thickenings about all vessels. In the right eye there are two hemispherical detachments on the retina alone, one at the macula lutea about three times the diameter of the papilla, and a larger one at the inferior nasal part of the fundus, extending to the extreme periphery. Except at these two places, the choroidal stroma is every-

where as distinctly visible as the retinal blood vessels, and everywhere requires exactly the same glass to observe it by erect ophthalmoscopic examination. The refraction of different portions of the fundus is as follows in the right eye : Disc centre — 1, edge + 1. Retinal detachment at macula with irregularity of lamina limitans interna + 8. Choroid and retina at temporal end of horizontal meridian + 12 (a slight retinal detachment more peripherally + 13). At nasal end + 12, and large retinal detachment more peripherally + 18. Retina and choroid at both ends of vertical meridian + 8. Left eye disc + 0.5. Macula + 1.5. Retina and choroid at nasal end of horizontal meridian + 8, and on another occasion + 12, at temporal end + 12. At upper end of vertical meridian + 7 and again + 4, at lower end + 5. Mr. Story referred to the cases of detachment of the choroid already published, and showed in what a remarkable manner the present case differed from all those which have been previously observed.

Temporal Hemianopsia of Left Eye and absolute Blindness of Right.—Mr. Story (Dublin) gave a further history of a case (not yet published) which he had brought before the Society in 1887. A girl, aged 19, came to him in 1885 with the right eye absolutely blind, and with complete hemianopsia of the left, the line of demarcation passing through the fixation point. The other symptoms were violent pains in the head, giddiness, vomiting, amenorrhœa, and tendency to corpulence. Since then these distressing symptoms have mostly subsided, but her field of vision remains unaltered, and central vision has considerably deteriorated. Vision which was in 1885 = $\frac{5}{7\frac{1}{2}}$ is now only = $\frac{5}{20}$ (?). Careful examination has completely failed to demonstrate the hemianopic pupillary reflex. Mr. Story suggested that the case might be one of a tuberculous growth in the region of the chiasma, which had now for some years ceased to increase. Charts of the field of vision, taken at various times during the last six years, were exhibited.

Card Specimens.—Mr. Tatham Thompson (Cardiff) : Emphysema of Conjunctiva.—Mr. Stephenson : Two cases of Peculiar Retinal Pigmentation.—Mr. Treacher Collins :

Epithelial Implantation Cyst.—Mr. Cowell; Congenital Fissure of Upper Eyelid.—Mr. Doyne (Oxford): Coloboma of Iris and Choroid, with bulging of corresponding portion of circumference of the Lens.

ERRATA.—Page 185, lines 11 and 18. For *inch* read *mm*.

INCIPIENT CATARACT; ITS ÆTIOLOGY, TREATMENT, AND PROGNOSIS.

By S. D. RISLEY, M.D., PHILADELPHIA.

In the issue of the *University Medical Magazine* for March, 1889, I published a brief paper on "Incipient Cataract," and again called attention to the same subject in a paper read before the Ophthalmological Section of the American Medical Association, at its meeting in May of the present year, the latter being based upon a new and more extended analysis of the material in hand. In these the opinion was urged that by regarding the hard cataract as one of the unavoidable concomitants of old age, the tendency had been to overlook the more potent factors in its production to be found in the pathological states of the intraocular tunics.

The hard and unelastic lens of advanced life is not necessarily an opaque lens, nor is approximately normal acuity of vision incompatible with old age. The opaque lens must therefore be regarded as an extraordinary condition, to be explained by other causes than senility.

In my early experience, when consulted by persons for failing vision due to commencing cataract, the habit was to acquaint the patient or some member of the

family with the cause of the impaired sight, and to state that at present no treatment would be availing; that the opacity would probably increase, but in the end vision would be restored by the extraction of the ripe cataract. Advice was given regarding the general mode of life, inquiry made about the general health, the conjunctival irritation habitually present prescribed for, and request made for an occasional consultation. The individual or his friends were thus left under the shadow of an abiding anxiety, alleviated only by the hope that, though blindness might, and probably would, ensue, vision would ultimately be regained by the surgeon's art.

A wider experience, with the resulting opportunity for independent observation, has convinced me that in a considerable number of these afflicted persons a more hopeful prognosis can be prudently given. In many cases the apparently progressing opacity of the lens can be arrested, in others the rapidity of its increase greatly retarded, thus maintaining a useful acuity of vision for a longer time, and failing in this, the treatment instituted will place the eye in a more favourable state for operative interference.

The clinical group under consideration does not include the larger number of patients with stationary opacities in the lenticular cortex of eyes otherwise healthy. Every ophthalmic surgeon whose experience extends over a sufficient length of time must have frequently observed these opaque masses remain unchanged for years, causing the patient little or no annoyance, since they are usually situated below the pupillary rim, and therefore do not impede the entrance of light to the retina. Nor does the clinical picture under contemplation include those cases of cataract which, by common consent, are regarded as complicated, or secondary, *e.g.*, the opacity of the lens which so frequently constitutes the closing scene in the de-

generative processes underlying and attending upon detachment of the retina, inflammatory glaucoma, irido-choroiditis, etc. No form of eye disease is more familiar to the surgeon than these destructive processes in the choroido-retinal tract, and while they are excluded from this study are nevertheless mentioned here as pointing most unmistakably to the important relation existing between opacity of the crystalline lens and the diseases which involve the integrity of the nourishing membranes of the eye. This large and important group of complicated cataracts might therefore have been included as illustrating a more advanced or a more violent type of disease than that contemplated in this article, but having a common pathological basis in the affections of the uveal tract.

I desire, however, to call attention to the very large group of eyes suffering from irritative and chronic inflammatory processes of the retina and choroid, which do not, for the most part, present the gross ophthalmoscopic changes which characterise the destructive diseases above referred to, but which may, and doubtless do, render the eye liable to these severer forms of disease, by steadily undermining its nutrition. A careful inquiry into the eye history of patients applying for relief from the violent affections of the eyes characteristic of the middle and later periods of life, elicits the fact that they have usually been sufferers either from weak eyes, recognised as such, or from symptoms justly attributable to eye strain. The contention is that these subacute pathological states are lighted up into violent forms of disease by the onset it may be of some constitutional malady, by some extraordinary or too prolonged use of the eyes, or by exposure to glares of light or to intense heat; and that such an occurrence is more likely to occur at a time of life when the vital processes are liable to impairment by disease, by overtaxing the energies in the accumu-

lating cares of life, or by physiological changes, particularly in the female.

Frequently, if indeed not usually, commencing early in life, these irritative processes are steadily progressive, unless arrested by appropriate treatment. To this category belong especially the eyes starting in life with errors of refraction, particularly astigmatism or muscular anomalies. The clinical picture presented by this large group of weak eyes is important to our purpose. Subjectively we have the familiar grouping of symptoms known as *asthenopia*. They present, however, very characteristic objective phenomena, which it is here designed to connect with the forms of disease so frequently seen after forty-five years of age, and more especially with beginning opacity of the crystalline lens. Much has been written to establish the relations existing between eye-strain, consequent upon errors of refraction, and the changes observed in the fundus of the eye. The too capillary optic-nerve surface, the indistinct and ragged nerve margins, the "ripe-peach" choroid, the woolly or fluffy eye-ground, the narrow crescent of choroiditis embracing the temporal margin of the optic-nerve and its steady advance to the large atrophic conus of the distended myopic ball, is a clinical picture, alas! too familiar to all. I am not so sure that we habitually connect with these intra-ocular disturbances the affections of the external tunics. The hyperæmia of the conjunctiva, the dilated anterior perforating vessels, the red and swollen caruncles, the blepharitis ciliaris, recurring styes, and the increased secretion and partial retention of tears are in these cases the external expression of the grave disturbance of the circulation of the intra-ocular membranes. It were cause for surprise if, in the presence of this general disturbance of the vascular system of the eye, the vitreous body and crystalline lens, divorced as they are from a direct vascular supply, did not frequently

suffer in their nutrition. Reasoning *a priori*, one would anticipate a proneness upon the part of these avascular structures to accept disaster in the presence of any cause which would impede their ready supply of nutriment. The chronic hyperæmia of the vascular choroid, however produced, by increasing the contents of the globe, must, it is obvious, cause increased intra-ocular tension, and thus lead to important mechanical interference with the circulation of blood and secreted fluids through the organ.

The veins, being more easily compressible than the arteries, would not readily, under pressure, empty the eye of its venous blood, which, as a physical necessity, would in a less degree control the rapid ingress of the nourishing arterial supply. By this mechanical means the circulation would be at least measurably retarded and the nutrition of the organ suffer a proportionate interference. In like manner the lymph channels and absorbents would be partially defeated in the proper performance of their functions. It is reasonable to suppose that the avascular tissues, the vitreous body, the crystalline lens, and the cornea would be prone to suffer harm under such conditions, a supposition the force of which finds ample demonstration in the steamy cornea of inflammatory glaucoma, the hazy vitreous with its web-like opacities in irido-choroiditis, and the swollen opalescent lens with its peripheral spicules of opacity and the steamy nucleus of incipient cataract. In the young eye these phenomena are averted by the stretching of the more yielding sclerotic, and we are called upon to observe the clinical picture of progressive myopia. The rigid sclerotic of later life changes the anatomical conditions, and permits the occurrence of those serious forms of disease so rarely seen before middle life, and among them lenticular opacity.

The uncorrected errors of refraction are doubtless the most frequent cause of the conditions here described,

especially among the educated classes and those persons whose vocation requires accurate vision for its proper performance. Among the additional causes, sufficient in themselves to set up and maintain an analogous choroidal state, and therefore equally baneful in producing the unfortunate sequelæ already described, may be mentioned the corneal maculæ or cicatrices left as a result of inflammation in childhood ; habitual exposure to light and heat, *e.g.*, amongst cooks, glassblowers, stokers and engineers, and in the case of the artisan at his work-bench, facing with unprotected eyes, for many hours daily, the open window or an uncovered gas-jet. Another fruitful source of trouble is the prevailing desire to avoid as long as possible the use of glasses to correct the presbyopia. It is obvious that all the evils attending upon eye-strain may be present here even in the emmetropic eye, and that, too, at a time of life when the attending dangers are greatly enhanced by the unyielding sclera. Many examples might be cited to illustrate the harm resulting from this erroneous habit of avoiding presbyopic glasses.

That these deductions are not based upon purely theoretical considerations finds ample demonstration in the following brief analysis (for which I am indebted to Dr. J. L. Carpenter) of 80 cases of advancing opacity of the lens, taken from my private case books, in each of which the record was sufficiently complete to answer the inquiry of this paper. Only those cases are included in which it was still possible to determine the condition of the fundus oculi in one or both eyes.

Regarding the time of life, it is of interest to note that but one patient was under 40 years of age, while nine were between 40 and 50, twenty-two between 50 and 60, thirty between 60 and 70, and eighteen between 70 and 85. There was a definite history, often of long duration, of asthenopia, *i.e.*, of weak eyes, headache, etc., fairly attributable to eye-strain in thirty-seven cases, or

46·2 per cent. Inflammations of the external tunics, lachrymal disease, etc., were present in 56·2 per cent. In the remaining cases the records are silent on this point. Hypermetropic astigmatism was noted, and in most cases corrected as an element in the treatment, in forty-one, and myopic astigmatism in seventeen cases, showing the existence of demonstrable errors of refraction in upwards of 70 per cent. of all the patients with incipient cataract: A detailed study of the records reveals the fact that the defect of refraction was in almost every case present in high degree, or differed widely in each eye. In several instances there was myopic refraction on one side, and hypermetropic on the other.

In the remaining 30 per cent. it was not possible to determine with any certainty the state of the refraction, owing to the condition of the media. In some of these, however, the presence of myopia was rendered probable by the fact that reading glasses had not been used even after fifty years of age. The presence of vitreous opacities is noted in 27·2 per cent., and demonstrable disease of the choroid in one or both eyes in 70·2 per cent.; 35 per cent. were suffering from headache, regarded as due to ocular conditions, when the patient first came under observation, all of whom were wholly or in large measure relieved by the treatment addressed to the local conditions. A more detailed study of the individuals composing this group furnishes many interesting suggestions of practical value in the management of incipient cataract. In those cases where the opacity advanced to the state of so-called "*ripe*" cataract, no sooner was the use of the eyes precluded by closing the pupil to the admission of light to the retina, than the pathological conditions of the external membranes began to subside, and with their disappearance there followed also great amelioration of the headache, dizziness, etc., from which old people with

"weak eyes" so constantly suffer. The subsidence of the external hyperæmia and the asthenopia render it highly probable that under the enforced rest the choroido-retinal disease also gradually subsided. In this we incidentally are taught the therapeutic value of rest and protection at an earlier stage of the disease, when by its arrest a still useful acuity of vision may be either permanently maintained or the progress of the opacification greatly retarded. My experience with aphakial eyes would seem to justify the judgment that sharpness of vision not greater than one-third to one-fifth is more satisfactory to the patient before extraction of the lens than a much greater acuity secured through the optical centre of a cataract glass with an aphakial eye.

The results of treatment in this group of patients, when faithfully pursued, were sufficiently encouraging to suggest the publication of this article. I have elsewhere published the histories in detail of a few illustrative cases (*Univ. Med. Mag.*, March, 1889) (*Trans. Amer. Med. Soc.*, 1891). The improvement of vision noted in almost all of the cases successfully treated *was in no case due to the absorption of the opacities already formed in the lens*, but to the improved condition of the choroid and retina, and the clearing up of the vitreous webs or the granular or sand-like deposit so frequently discovered in the anterior part of the vitreous body when studied with a convex glass. Even in those cases where the treatment failed to arrest the advancing opacity, the patient was nevertheless made more comfortable by it, and the general condition of the eye improved. The treatment adopted was to require as complete rest as possible from all work at a near point, the use of smoked glasses when necessarily exposed to bright light, and the local employment of mild washes and astringents to the conjunctival sac, together with the moderate use of the mydriatics, preferably a solution of homatropine.

Internally iodide of potassium or iodide of iron, and bromide of potassium or lithium, etc., if headache were a marked symptom. If these were not well borne the chlorides were substituted, or in many cases were used in alternation with the iodides. As soon as it proved feasible any existing error of refraction was very carefully corrected and the correcting glasses required to be worn constantly, suitable correction for a near point being allowed for all *necessary* work. The experience with these patients and many others in advanced life in whom the mydriatics have been used over long periods, more or less regularly, has served to convince me that there is an unwarranted dread of the use of mydriatics in patients who have passed beyond the middle period of life. With but few exceptions they were used, not only without harm, but with great comfort and benefit. When the mydriatic solution did not seem longer indicated, I have frequently used weak solutions of eserine. This drug was also used in a few instances from the beginning of the treatment, when it seemed indicated by slight increase of tension, or by irregularities in the field. In no case do I recall the slightest harm having resulted from the use of the mydriatics, except in causing some conjunctival irritation when long continued. In a few instances there have been relapses after a few years. One of these cases is included in the published group above referred to. In many of the cases it was very gratifying to see the sharpness of vision improve week by week *pari passu* with the improved nutrition of the eye.

In brief, a careful study of these patients has seemed to justify the conclusions:—

That cataract, although a disease of advanced life, is not necessarily a senile change; but originates in local pathological states involving the nutrition of the eye itself.

That, in the stage of incipency, cataract is amenable

to treatment by such measures as are calculated to remove the pathological conditions upon which it depends; that we are therefore justified in giving a more hopeful prognosis to many persons with commencing cataract.

That, although the treatment may fail to arrest the progressive degeneration of the lens, the eye, by virtue of the treatment adopted, will be in a better condition to submit to the trials of surgical interference.

C. SCHWEIGGER (Berlin). Glaucoma and Diseases of the Optic Nerve. *Reprint from the Archiv. f. Augenheilk., Vol. XXIII.*

In an article filling seventy pages, Schweigger minutely discusses various points in the diagnosis and treatment of glaucoma. The subject is handled throughout from the clinical point of view, and each point is illustrated by a record of one or more cases. At the same time questions of pathology are incidentally noticed, and the interest of the paper is enhanced by the fact that the author is strongly opposed to the views which have been gaining ground of late years.

The first and perhaps the most important point in the paper is the question of founding a diagnosis of glaucoma upon the excavation of the optic disc. Von Graefe himself declared that the typical excavation reaching to the margin of the disc is not by itself sufficient for the diagnosis of glaucoma, for it occurs also in cases of a different nature. Schweigger urges that this fact has been much lost sight of. The typical excavation without discoverable increase of tension is not uncommon. How is it to be explained? Physiological excavation—the author would limit this term to those cups which occupy more than one-third of the surface of the disc—is common. When present in one eye, it is

always present in the other, though there may be slight differences between the two. It is frequently hereditary. It is not specially connected with any type of refraction. The floor of the cup sometimes lies behind the level of the choroid, the vessels may be hidden by the overhanging margin of the cup, and the margin may lie in extreme cases very near to the true margin of the disc. In advanced life, when the transparency of the retina decreases, such a physiological excavation may bear a very close resemblance to the true pressure cup, and the author assures us that he has seen cases of this innocent kind in which celebrated oculists had not only performed iridectomy, but produced traumatic cataract; and that other patients, fleeing from similar treatment, have remained for years under his own observation with normal vision and uncontracted fields.

The differential diagnosis becomes extremely difficult when, to a pre-existing physiological excavation, atrophic changes are added. In atrophy of the optic nerve the surface of the disc becomes retracted, and the vessels are sometimes sharply bent at the disc-margin, but the lamina cribrosa does not usually lie at a deeper level than the choroid. In presence of a large and deep physiological excavation, however, atrophy of the nerve will produce a condition very closely resembling the pressure-cup. A diagnosis of glaucoma simplex is then likely to be made, for it is easy to persuade oneself that the eye feels a little hard when one is convinced that it is suffering from glaucoma. Schweigger is satisfied that cases of glaucoma simplex fulminans—cupping of the disc and rapid loss of vision without congestive symptoms—are really cases of atrophy of the optic nerve occurring in presence of physiological excavation.

Glaucoma simplex, so-called, includes then two entirely different processes: true glaucoma on the one hand, physiological excavation, modified by atrophy, on the other. How are these to be distinguished? If the one disc is cupped while the other is flat, there is glaucoma; for a flat disc is never excavated except by glaucoma. If both discs are excavated the distinction is more difficult. Atrophy of the secondary kind, following such conditions as choroiditis,

neuro-retinitis, embolism of the retinal artery, and so forth, will usually be recognised as such ; but primary atrophy, especially when not connected with other nerve symptoms, is, under the circumstances in question, extremely likely to be mistaken for glaucoma simplex.

In the next place, Schweigger discusses the various other symptoms of glaucoma with respect to the aid which they afford in making the diagnosis, and shows that in almost every point uncertainty is possible. Thus, the contraction of the visual field in glaucoma always begins in the inner half of the field ; in simple atrophy of the nerve it sometimes does the same. Colour-perception in glaucoma remains normal in the active portion of the field ; it occasionally remains normal in simple atrophy also. The excavation of the disc, as already pointed out, is not a certain guide, for there are pressure cups which do not extend to the margin of the disc, and there are cups not due to pressure which involve the whole area of the disc. The tension of the eye, again, is not always a positive indication ; if one eye be distinctly harder than the other, then we have glaucoma ; but if the two eyes are alike in this respect some doubt must remain, although both may feel a little hard, for the limits of physiological tension are different in different individuals.

The only safe course with regard to the diagnosis is to keep the patient under observation for a considerable time, and especially to teach him to notice whether his vision is disturbed by periodical and transient obscurations, and by the appearance of rainbow circles round a light. One of Schweigger's patients was in the habit of striking a match for the latter purpose when he felt anything wrong with the eye. It is especially insisted on that glaucoma in its early stages is always characterised by periodical exacerbations and remissions, and that a glaucoma simplex which gradually leads on to blindness without these variations has no existence. The fact that patients have not observed such variations simply shows that they are bad observers. In simple atrophy, on the other hand, the gradual progress towards blindness may be entirely unbroken in this way.

While discussing the intermittent character of glaucoma,

Schweigger pauses for a moment to attack the so-called retention theory. The following quotation will no doubt approve itself to those who are still unable to accept the evidence on which that theory stands:—"These slight attacks of glaucoma, often lasting only a few hours, clearly disprove the retention theory. How is that theory to be reconciled with the fact that the attacks occur suddenly, and soon afterwards disappear spontaneously? How can the filtration at the angle of the chamber be so suddenly interrupted and so wonderfully soon re-established? It is put down to a swelling of the ciliary processes, for people can say what they like about these organs—in the living eye, with a normal iris, the ciliary processes are invisible . . . Moreover, the occurrence of glaucoma in aphakial eyes tells against the retention theory."

The treatment of glaucoma comes next under consideration, and the time-honoured rule is maintained, that so soon as glaucoma is definitely diagnosed, even though in its earliest stage, iridectomy should be performed. "With eserine," the author says, "a few days may perhaps be gained, but as a rule its use results merely in loss of time." The use of cocaine in combination with eserine is not referred to. Iridectomy gives its best results in cases of acute inflammatory glaucoma, because the loss of sight in this condition depends largely on the opacity of the cornea, and the immediate pressure upon the retina, both of which are at once relieved by the operation. A deterioration of vision after an iridectomy is most to be feared when the limit of the contracted field lies already very near to the fixation point; still Schweigger is able to refer to many cases of permanent preservation of the remaining vision, where the field had already contracted to about 10 degrees from the fixation point. He points out that in cases of extreme contraction, what appears to be centric vision is really often excentric, the patient fixing the test letters with some point slightly removed from the fovea centralis, and that, when tested for reading, the vision will be found relatively worse than in deciphering single test-letters. In cases of atrophy with excavation simulating glaucoma, a further deterioration after iridectomy is a matter of course.

In a small proportion of cases glaucoma relapses even after a well-made and timely iridectomy. The term malignant glaucoma is applied by Schweigger only to those cases in which the relapse occurs during the healing process. In his private practice he has met with seven of these malignant cases, and here records them in full. In every instance the anterior chamber remained permanently abolished. In one instance a paracentesis of the cornea had been performed several days before the iridectomy, and the anterior chamber had refilled in the usual way, whereas after the iridectomy it remained permanently empty. From this observation Schweigger draws the general conclusion that the malignant course in this group of cases is due, not to the emptying of the anterior chamber by the iridectomy, but to some constitutional anomaly of the eye which cannot yet be diagnosed. He does not refer to Weber's explanation of these cases, or to Weber's operation for replacement of the lens—scleral puncture together with pressure on the cornea—by means of which, in some cases at least, the anterior chamber may be re-established and the malignant course cut short. He urges, in view of the fact that when one eye runs a malignant course the other is almost sure to do the same, that in all cases of chronic glaucoma the worst eye should be operated upon first, even though it be already blind; if the healing process run a normal course, the fellow eye may then safely be dealt with in like manner.

With regard to sclerotomy, Schweigger holds that the possibility of the malignant course above referred to is no reason for employing this operation in place of iridectomy; that its results are inferior and uncertain as compared with those of iridectomy, and that disasters such as profuse hæmorrhage from the retina may occur after sclerotomy just as after iridectomy. He records a series of cases showing that an iridectomy may succeed where a previous sclerotomy has failed. Lastly, passing from practice to theory, he concludes that the essential step in a glaucoma operation is the excision of a piece of the iris. "What the connection is we do not know."

The last part of the paper deals chiefly with certain

varieties of secondary glaucoma, and here the author is very severe upon those of us who apply the term glaucoma to all eyes which suffer through an increase of the intra-ocular pressure. He recognises two well-marked forms, namely the so-called hæmorrhagic glaucoma, and that which arises through posterior synechia with occlusion of the pupil and bulging of the iris, the drag upon the ciliary body being, he thinks, in the latter case, the cause of the glaucomatous complication. He doubts the propriety of including cases of high tension following cataract extraction, and with regard to other varieties of secondary glaucoma he declares that they are a mixed lot to which the name is often applied "simply for the sake of saying something." "Truly," he says, "if eyes which are called glaucomatous merely because it sounds well are enucleated for the sake of pathological examination, it is no wonder that nothing comes of them." The principle which guides Professor Schweigger in the use of the word glaucoma is, however, not apparent. He calls hydrophthalmos a glaucoma because it leads to blindness with excavation of the optic nerve ; but blindness and excavation occur sooner or later in every case of persistent increase of pressure, and are the chief characteristics of these numerous hard enucleated eyes which our author declines to call glaucomatous.

In support of his objection to the retention-theory, Schweigger cites a case of acute secondary glaucoma produced by dislocation of the lens into the anterior chamber, published by the present reviewer. He admits that he has often seen severe pain and inflammation produced by this accident, but not glaucoma ; moreover, he is convinced that closure of the filtration angle cannot be directly caused by such a dislocation, but must be, if it occurs at all, a late result of the inflammation. Of these opinions we will only venture to say that they are diametrically opposed to the facts which have come under our own observation.

Of more practical importance are certain observations concerning the treatment of some forms of secondary glaucoma. The treatment of hydrophthalmos by iridectomy is usually considered unsatisfactory, but Schweigger has treated many cases in children with success, the important

point being to make the incision at the inner margin of the limbus of the cornea rather than in a more peripheral situation. In hæmorrhagic glaucoma also iridectomy has an undeservedly bad repute, for in many cases which have come under his observation a timely operation would have preserved useful vision ; the disasters following iridectomy in such cases occur chiefly when vision has been already lost.

In addition to those we have mentioned, this article contains many clinical observations of much interest and importance.

P. S.

NIEDEN (Bochum). On the Value of Fluorescine in Galvano-cautery Operations. *Centralblatt für prakt. Augenheilk.*, May, 1891.

Treatment of certain forms of corneal inflammation with the galvano-cautery has proved of such value to all who have had suitable opportunities for its use as to need no further recommendation. Kämpfer, however, has asserted that in the severer cases of *ulcus corneæ serpens*, use of the cautery invariably leads to a prominent leucoma or partial staphyloma, while the healing of the slighter cases is actually delayed,—recurrent inflammation of the scar being frequent. On the strength of thousands of reported cases of the milder form of the disease, Nieden denies this assertion, and refers the staphyloma resulting in the severer to the ulcerative process itself ; his observations do not at all agree in this particular with those of Kämpfer.

Use of fluorescine has two great advantages : viz., the certainty with which one is enabled to select the cases suitable for treatment with the cautery (which he greatly prefers to the more clumsy method of electrolysis), and the fact that one can now, with so much ease, especially since the introduction of cocaine, decide exactly how much of the

tissue is affected, and, therefore, how much must be cauterised.

Although, in a former article, Nieden said that he rarely found it necessary to use the cautery more than once in any given case, yet certainty of the precise area requiring cauterisation was not attained until the diagnostic value of fluoresceine in this particular was made known. The potassium salt of this substance, in 2 per cent. solution, affords a rapid and most convenient means of determining the limit of epithelial loss, whether the ulceration be superficial, traumatic, or the expression of a purulent inflammation. He takes, as an example, the *ulcus serpens*, the characteristic features of which, as described by Saemisch, are beautifully exhibited, with its crescentric area of infiltration often separated from the ulcer itself by a narrow band of still pellucid cornea. The finest divisions radiating from the ulcer into clear cornea are by means of fluoresceine exhibited to the naked eye with a distinctness formerly to be attained only by means of a lens or corneal microscope. Thus the lateral spreading, and also the depth of the ulcer are clearly shown, the green tint of the floor of the ulcer standing out sharply against the yellow pus on the posterior layers of the cornea and in the anterior chamber. It only remains now to cauterise the green-tinted parts; when that is done, one has destroyed the infecting material, and the operation will almost certainly not need to be repeated.

He draws attention to the fact that one not infrequently sees at the edge of the region infiltrated by the pus one or more small, sharply-outlined, infected areas. Even by focal illumination these are invisible, owing to the diffuse opacity at the edge of the ulcer, but are brought clearly into view as independent spots by their taking on the green colour of fluoresceine. Thorough cauterisation of the main ulcer will not suffice to arrest the spread of the disease unless these little areas are also touched. He points out the analogy here between *ulcus corneæ serpens* and rodent ulcer.

In a similar manner fluoresceine assists one in cases of the more malign variety of phlyctenular keratitis, for the infective material is present in that part of the affected

region which is pushed in front of the leash of vessels, and this is tinted green by the fluid. This portion in front of the deeply-lying vessels is otherwise not easily recognised even by oblique illumination. It might be thought that the use of fluorescine would thus encourage much more extensive application of the cautery ; but this is not so, for one is now able to touch with the hot wire all those parts which require it, and, at the same time, to avoid injury to any portion hitherto unaffected by disease. Healing is thus at once inaugurated.

Nieden has found the method of even greater value in the rarer form of recurrent keratitis with loss of substance, principally in the variety known as "nail-scratch keratitis," in which recrudescence often takes place with violent subjective symptoms and signs of irritation, months or even years after the original injury. Focal illumination is difficult in these cases on account of the ciliary irritation and photophobia, but fluorescine gives much assistance by tinting the site of the injury, which is also the site of the fresh inflammation.

What is seen is not a sharply-outlined green spot, as in loss of epithelium, but a faint greenish-streaked area, as if the epithelium had been torn as it was raised and the colouring fluid had passed into separate small furrows. But when the irritation has caused the patient to rub his eye and so peel off the epithelium, the appearances are as in other cases. Here, again, Nieden disagrees with Kämpfer, for in these cases of keratitis he has found the cautery of great use, both as regards the immediate condition and permanent healing. He uses it very lightly, just touching the green area and no more. He strongly recommends the cautery for this form of keratitis, so trying to the patience of both sufferer and surgeon by its often-repeated, sudden returns of violent irritation. In order to avoid leaving any opacity of the cornea, he uses the cautery at a dull red heat, and, as above said, touches very lightly ; after a time, he says, scarcely a trace of any opacity can be made out.

WILLIAM GEORGE SYM.

G. W. JACOBY (New York). Acute Transitory Blindness and Whooping-cough. *New York Medical Journal*, Feb. 28th, 1891.

Complete loss of sight, occurring suddenly and lasting but a short time, in connection with acute specific disease, has usually been noted in association with nephritis and uræmia. Cases not so associated must be rare, and are certainly of especial interest. Jacoby reports two connected with whooping-cough.

The first patient, a girl aged six years, had a history of convulsions with pneumonia when two years old, and severe occipital headaches preceding other acute diseases. She had had whooping-cough for several weeks, sometimes with vomiting, but on the whole it was rather a mild attack. The occipital headache had been present. Early one afternoon she complained of its being dark, had a staring expression, and was found to be blind. Next day Dr. Gruening found the pupils dilated *ad maximum* without reaction to light or convergence. There was double optic neuritis, without hæmorrhages. She had quantitative perception of light. On the day following she was examined by the writer. Her nervous system seemed otherwise normal, as were also her kidneys and heart. Her appearance was cachectic. On the fourth day the right pupil reacted to light, and she recognised, with that eye, large objects. Two days later a similar improvement had occurred in the left eye. On the tenth day she could count fingers across the room, and the optic papillæ were "slightly hazy." On the fifteenth day she had quite recovered.

The second patient, a boy aged eight, had been coughing over a month, had vomited and complained of headache in connection with paroxysms, which were not especially severe. After being unusually peevish and irritable, he complained of intense headache, and vomited without coughing and without having taken food. He was kept in a dark room with ice to his head for three days. Headache and vomiting ceased, but he complained of inability to see.

On the fifth day he was taken from the dark room and found unable to distinguish light from darkness. In all other respects he was normal. The fundi and external appearances of the eyes were normal, and the pupils reacted normally to light. There was no change until the tenth day, when he was able to count fingers at six feet in the left fields, with well-marked right homonymous hemianopsia. For twenty-four hours he showed no change, but on the twelfth day there remained only hemiamblyopia, and two days later there was normal vision throughout the visual fields.

Jacoby finds among previously reported cases only two strictly comparable to his own, those of Alexander, in one of which the reaction of the pupils and the appearance of the fundus remained normal, but the child died comatose with symptoms of cerebral pressure on the fourteenth day, while the other was attended with dilated fixed pupils and optic neuritis, which, however, passed into partial atrophy, so that the recovery was incomplete. Jacoby accepts for these cases the explanation offered by Ebert for his cases occurring in connection with nephritis after scarlet fever and typhus, viz., that of a transient œdema, whether this œdema involve the nerve as in the first case, or the occipital lobe as in the second.

E. J.

R. KALISH (New York). Absorption of Immature Cataract by Manipulation, with Instillation.
Medical Record, Mar. 29th, and Dec. 20th, 1890.

Kalish reports twenty-four cases, with illustrations representing the progress of the lens opacity towards absorption in five cases, describes his plan of treatment, and calls attention "to the unvarying and permanent success" attending it. His positive conclusions are that immature uncomplicated cataract can be benefited to the reacquisition of reading power, that is, to good useful vision; incipient

cataracts and those which have passed into a state of immaturity can be entirely absorbed ; that the effects are permanent ; and the sooner the cataract comes under treatment the better the result.

The treatment consists in instilling into the eye two drops of a solution of equal parts of glycerine and a one per cent. solution of boric acid in rose-water. The surgeon then stands behind the patient, and over the closed lids places his middle finger on the nasal side of the eyeball, the index and ring fingers resting on either side of it. The three fingers are then passed with slight pressure towards the temporal side of the globe. And this stroking, always in the same direction, is repeated twenty to thirty times a minute for ten minutes. Then a second instillation is made, followed by a second similar period of stroking ; and this by a third instillation and like period of stroking, which completes the manipulation. This treatment may be repeated daily, and the period of stroking may be lengthened. It may be continued for three or four months, but should be suspended as soon as it ceases to improve vision.

The only explanation of the improvement offered is that the manipulation quickens the intraocular circulation. It is pointed out that some diminution of the tension of the globe is caused by the treatment. Kalish found dyspepsia present in nearly all his cases, and regarded it as an important factor.

The second of these papers was read before the New York County Medical Association, and, in discussing it, Dr. H. D. Noyes regretted that the paper had not connected the treatment more directly with the pathology of cataract. He pointed out that the drawings represented a single unusual form of lens opacity, diffuse and free from striæ. He had for years been in the habit of telling a certain class of these patients that something could be done for them, and that after a time they would see better. Dr. H. Knapp also noted the peculiarity of the drawings. They represented an anomalous form of cataract.

The subject is of especial interest in connection with the paper by Risley, published in this number of the REVIEW ; and in connection with a case reported by Mr. Tatham

Thompson, in the *R. L. Ophthalmic Hosp. Rep.*, Dec., 1890, in which, after Foersters' operation for the artificial ripening of cataract, the lens cleared up so that only a trace of granular opacity was left, and with presbyopic correction the patient read moderate-sized print with comparative comfort.

E. J.

COÛËTEUX (Nantes.) Spring Catarrh. *Annales d'Oculistique*, March—April, 1891.

TROUSSEAU (Paris). Spring Catarrh. *Annales d'Oculistique*, May—June, 1891.

The first of these papers was written with the object of drawing attention to the connection between spring catarrh and naso-pharyngeal disease. The second was published by Trousseau after perusal of the first, and to a certain extent supports the suggestion made by Coûëteux, that the eye affection under discussion may arise secondarily to disease of the nasal and pharyngeal mucous membrane.

Spring catarrh appears to be frequently met with in the neighbourhood of Nantes, and Coûëteux refers to the want of success, in his own cases, of ordinary treatment of the conjunctiva. He gives notes of one case, in a lad of 16, in whom no real improvement in the eye symptoms resulted from local treatment by means of calomel, bichloride of mercury lotion, etc. Despairing of effecting a cure, the author proceeded to relieve the patient of his naso-pharyngeal disease, viz., adenoid growths. The applications to the eyes were left off. Improvement of the conjunctival disease quickly followed removal of the adenoid growths, and after a second operation upon the nose and pharynx, the patient entirely recovered from all ocular symptoms.

Trousseau refers to four cases under his care. The first was very similar to Coûëteux's, both as regards ocular and nasal symptoms, treatment and progress. In the remaining three no adenoid vegetations were found in the naso-pharynx, but other definite changes in the mucous membrane and the middle and inferior turbinated bones were present. In these three cases treatment of the nasal

and pharyngeal disease had no very decided effect upon the conjunctivitis.

Although neither author maintains that naso-pharyngeal disease is alone the cause of the conjunctival affection known as spring catarrh (Coiïeteux suggests calling it nasal conjunctivitis), the evidence they bring forward is sufficient to render it very desirable to have the nose and pharynx carefully examined in all cases, or at least in those which do not yield to ordinary methods of treatment.

J. B. L.

AMERICAN MEDICAL ASSOCIATION.

SECTION OF OPHTHALMOLOGY.

MEETING AT WASHINGTON, MAY, 1891.

Chairman: Dr. LEARTUS CONNOR, of Detroit.

The Chairman, in his annual address, offered a series of suggestions for the extension and improvement of the work of the Section. An important step in this direction would be the republication of the Transactions of the Section from the Journal of the Association in a separate volume, which might also contain a full list of the members of the Section, and other matter of interest to ophthalmic surgeons.

Incipient Cataract.—Dr. Risley read a paper upon this subject, published in substance on page 225.

Dr. J. L. Thompson thought that in the causation of non-traumatic cataract heredity played a very important part. In his observation, sharply-defined opacities in the lower inner quadrant of the lens, not extending up to the centre of the pupil, were apt to remain stationary for very long periods. He wondered why opacities were so frequently present, and almost or wholly confined to this portion of the lens.

Dr. Randall deemed incipient cataract of great importance on account of its frequency, and his experience coincided with Dr. Risley's as to the arrest of the process by the removal of eye-strain, and attention to all points of ocular hygiene. He thought it was manifested in the lower

inner quadrant of the lens because this portion is especially dependent on the corresponding quadrant of the choroid for its nutrition, and that portion of the choroid is most exposed to light, and therefore is liable to suffer most from choroiditis. It was this part of the choroid that he habitually turned to for signs of choroidal inflammation or irritation.

Pressure on the Eyeball after Cataract Extraction.—Dr. Edward Jackson called attention to the fact that the incision that destroys the power of the sclero-corneal coat to resist the intra-ocular tension also permits the escape of the intra-ocular fluids, and so reduces that tension to zero. Thus there is established a new equilibrium that lasts until the lips of the wound have become adherent firmly enough to prevent the escape of fluid, or their own relative displacement. During this period the lips of the wound are kept in apposition simply by the elasticity of the coats, and external pressure can only lead to displacement, because there is no force to resist it.

It has been pointed out by Norris that the common displacement is over-riding of the corneal flap upon the stump. This is the deformity that would necessarily result from excessive comparatively uniform external pressure.

The bandage after cataract extraction tends to secure fixation of the globe, by excluding visual impressions, for which purpose it must be applied to both eyes; by a reflex inhibitory influence over the ocular movements exerted by the constant contact of the dressing with the closed lids; and, lastly, by pressure opposing any ocular movement by a mechanical resistance applied to the eyeball itself. To do mechanical violence to the globe for the purpose of preventing movements that might possibly do it a lesser degree of violence is utterly irrational. And as no pressure that can be employed can entirely fix the globe, its movements under a fixed pressure dressing subject it to a sort of massage.

Hence a consideration of primary importance in the choice and application of a dressing after cataract extraction is the complete avoidance of pressure on the eyeball.

The Technique of Cataract Extraction.—Dr. J. J. Chisolm, of Baltimore, ascribed to improved technique and

cleanliness the improvement in results from this operation that had occurred during his professional life. The only preparatory treatment now given his patients is a warm bath. Instruments are disinfected by boiling water, the eye and surrounding parts by sublimate solutions. He keeps control of the movements of the lids and globe by the speculum and fixation forceps until the lens has been expelled. The ideal method includes the removal of a portion of the anterior capsule. He now does about eighty per cent. of extractions without iridectomy. The after-treatment is conducted in light rooms with light dressings confined to the eye operated on.

Personal Restraints during the Healing of Corneal Wounds.—Dr. T. E. Murrell, of Little Rock, offered a plea for greater personal liberty for patients of this class. Most surgeons regard restraint of the movements of the eye and of the whole body as essential. Four years ago he had adopted the practice of Michel, of doing iridectomy as an out-patient operation, and, finding this satisfactory, he commenced to extract cataracts at the hospital, and allow the patients to ride or walk home after the operation. Subsequently he tried the leaving open of the sound eye. For two years he has habitually done iridectomy and cataract extractions in his consulting-room, where it is possible to command better facilities and assistance, and had the patients immediately taken home, with only the eye operated on closed with a strip of plaster. The cases treated during this period had presented fewer complications than had been encountered before, and had done well in all respects. It must be remembered that restraints are very hard on old people, and, if not necessary, they are cruel and useless.

Apparatus for Protecting the Eye after Cataract Extraction.—Dr. G. E. Frothingham, of Detroit, believed it was sometimes impossible to securely apply the bandage without making undue pressure. And in three of his cases sight had been lost by injury accidentally self-inflicted several days after operation, and no bandage could give efficient protection against such injuries. The paste-board shield is necessarily injured by moisture and heating, and an

extemporaneous mask made from wire gauze cannot be accurately fitted unless of such light wire that it must fail to protect the eye from injury. He had therefore had a mask specially woven for the purpose, which was capable of giving perfect protection, and could not be so displaced as to cause injury.

Contributions to Keratometry.—Dr. Swan M. Burnett, of Washington, had for seven years been using regularly the ophthalmometer of Javal and Schiötz, and regarded it as an instrument of great practical value in the detection and measurement of astigmatism. Corneal astigmatism against the rule, that is the curve with the shorter radius horizontal or nearly so, is very rare. He believed astigmatism of that kind to be generally due to a tilting of the lens. He found that usually the ophthalmometer exaggerated astigmatism according to the rule, and underestimated astigmatism against the rule, the error in either case being about 0.50 D. A greater discrepancy than this between the corneal and the apparent total astigmatism calls for the use of a mydriatic. The instrument is useful in that it shows changes in the amount of astigmatism, either transient or permanent. After cataract extraction the astigmatism is usually against the rule. Squint operations are not found to produce any change in the corneal curvature.

Full Correction of Ametropia.—Dr. Jackson urged that where the use of correcting glasses was indicated, the rule should be to order those which would allow the use of ametropic eyes under as nearly as possible the same conditions as obtained for the emmetropic eye. This view found strong support in his clinical experience. As to astigmatism this rule is widely followed, but for hypermetropia there is a common belief that many young persons cannot become accustomed to the full correction. This belief probably is largely based on the fact that they never can become accustomed to an over-correction. The lens giving best vision at fifteen or twenty feet is an over-correction for all greater distances. And though the error is slight, such glasses will never prove satisfactory to one who can without them enjoy good vision. In myopia

the fear is that use of the power of accommodation will increase intraocular tension. The experimental evidence on the subject is contradictory and quite inapplicable. The increased venous pulse during accommodation is more probably due to increased innervation and contraction of the recti muscles concomitant to the act of accommodation than to the act itself. Incomplete correction of myopia has its special dangers more to be dreaded than the hypothetically injurious influence of accommodation. By experience he had been led to order the full correction with increased confidence even in the higher degrees of myopia.

Dr. Thompson thought such doctrine extremely dangerous, and Dr. G. M. Gould found eyes that persistently refused to accept the full correction for hypermetropia.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

FRIDAY, JULY 3RD, 1891.

HENRY POWER, M.B., *President, in the Chair.*

Perchloride of Mercury in the Curative Treatment of Trachoma and other Conjunctival Diseases.—This paper (by Mr. Kenneth Scott, Cairo) was read by the Medical Secretary. Mr. Scott had had a large experience of trachoma in Egypt, and, after trial of several methods of treatment, had decided in favour of perchloride of mercury. He used a 4 per cent. solution made by dissolving the salt in glycerine, and then diluting with water. This he applied to the everted lids once a day, and in addition gave the patient a $\frac{1}{4}$ per cent. solution to be used thrice daily. Iron tonics were usually prescribed during the treatment. Most of the cases were treated as hospital out-patients; a few were admitted to the wards. Mr. Scott's results with this treatment, had been very satisfactory, nearly all cases being cured in about eight weeks. A similar treatment had proved very efficacious in ophthalmia neonatorum, the administration of iron being omitted in these cases.

Mr. Mackinlay referred to the fact that the use of the perchloride was by no means new. The older writers nearly all recommended it, but the strength of the solution used had varied at different periods.

Mr. Juler was inclined to think Mr. Scott's records were too good to be true. He had used perchloride of mercury in the solid pencil combined with nitrate of potash, with satisfactory results, but his cases were not cured so rapidly as Mr. Scott's.

Mr. S. A. Stephenson said he had an extensive experience of trachoma, and had employed perchloride of mercury in 1 per cent. solution. Although a valuable remedy, he did not think it could be considered a specific. He had invented the pencils referred to, their composition being 1 of perchloride and 4 of nitrate of potash.

Mr. Silcock expressed his satisfaction with the perchloride in trachoma, but did not regard it in any sense as a specific for the malady.

On a Peculiar Form of Retinal Pigmentation.—Mr. Sydney Stephenson read a paper on a peculiar variety of pigmentation of the retina, of which he had observed three cases during the examination of 2,500 eyes. The characteristic ophthalmoscopic appearances consisted of variously-shaped groups, composed of dark coloured spots, arranged over a sector-like portion of the fundus. In each patient (all of whom were males) one eye alone was affected; the sight was normal, and the visual fields not contracted; night blindness was not present. Moreover, though the cases were under observation for a lengthened period, the pigmentary groups remained stationary. A similar condition, Mr. Stephenson stated, is described in Jaeger's *Hand Atlas*, Jaeger regarding the change as an anomalous form of retinitis pigmentosa. Mr. Stephenson, however, relying on the unimpaired visual fields and the non-progressive nature of the deposits, believed that the condition was physiological. He was inclined to think that the pigmentary changes described are allied to those small aggregations of retinal pigment which may be found in 8 per cent. of healthy eyes, and, in explanation of both these conditions, suggested that the development of pigment cells in the proximal plate of the optic cup had

overstepped its usual limits, and in this way produced the changes in question.

Mr. Jessop asked the position of the pigmentation. From the drawings shown he thought the changes were chiefly in the region of the choroidal cleft.

Dr. Anderson referred to cases of his own mentioned by Mr. Stephenson, and showed a drawing of the right fundus oculi of a boy, aged 15, suffering from rheumatic endocarditis, which exhibited groups of pigment deposits, each deposit being angular in shape. The left eye of the same patient contained a large mass of homogeneous black pigment on the nasal side of the optic disc. He had come to the conclusion that the changes were congenital and physiological.

Mr. Frost said that the physiological or pathological nature of the pigmentary changes could be determined only by noting whether they were progressive or stationary.

Mr. Nettleship thought that the normal appearance of the choroidal pigment epithelium in Mr. Stephenson's cases was good evidence of the physiological nature of the pigmentation. He was not cognisant of any retinal or choroidal pigmentation of pathological origin in which the hexagonal pigment layer remained unchanged.

On the Consensual Pupillary Light Reflex in Cases exhibiting the Argyll-Robertson Pupil Symptom in one Eye—Mr. Jessop read notes of five such cases (three occurring in Dr. Ormerod's practice); three were cases of tabes, one doubtful tabes, and one probably sclerosis of posterior and lateral columns. In all, though the contraction of the pupil associated with accommodation was present in both eyes, the direct and consensual light reflex was lost in one and the same eye. In all the cases, also, the consensual light reflex was present in the sound eye, thus showing that the optic nerve of the affected eye was capable of carrying impulses to the light reflex centre of the opposite eye. The lesion in these cases is probably one affecting the light reflex centre for one eye near the endings of the afferent part of the reflex arc. These cases strengthen and uphold the theory of the decussation of the optico-pupillary fibres.

Two Cases of Complete Blindness, with good Pupillary

Light Reflexes.—Mr. Jessop related two cases. The first was a boy, aged 16, with history of $2\frac{1}{2}$ years' blindness, suffering apparently from "cerebral tumour." Both optic discs were white and atrophied, with small arteries. The pupils were very active to light, both direct and consensual, and also acted to accommodation and convergence. The second case was a man, aged 34, who had been blind for six months, with loss of knee-jerks. The optic discs were atrophied, with small retinal arteries; the direct and consensual light reflex was present, and the pupils contracted with convergence and accommodation.

Nystagmus in a Composer.—Mr. Snell (Sheffield) brought forward this case. The patient, aged 21, had just completed his apprenticeship, and was engaged on the staff of a large daily paper. He came under observation on October 17th, 1890. His work for some months had been heavier than usual, the hours from 7 p.m. to 3 a.m. Two days before coming to Mr. Snell he returned home from work, went to bed, and rose as usual at 12 (noon). Then he noticed objects moving up and down, with some giddiness, but no pain in the head nor sickness. The nystagmus was found to be vertical, and the movements were rather jumping; there was quivering of eyelids. He was carefully examined for any central or other lesion, with negative results. The absence of any assignable cause and the resemblance in some particulars to miners' nystagmus suggested inquiry as to the way his work was performed. He was visited at the printing office, which was of course well lighted, and it was found that when he looked up to his "copy," instead of raising head and eyes together, he elevated the eyes only. This was fully described. Anyone trying it will find out how tiring it is. Other men at work raised the head with the eyes. The patient gradually recovered, the oscillations disappeared, and he returned to work on December 30th. He now works with comfort, having adopted the suggestion as to raising his head at the same time that he looks up from the type to the "copy." Quite recently he has developed "compositors' cramp" in the right hand, and is incapacitated thereby from doing his work. Mr. Snell alluded to his views as

to miners' nystagmus having for its prime cause the constrained position in which coal-getters worked. He mentioned instances occurring in men (not practical colliers) working at the pit bottom in good light, whose gaze was constantly turned up as the cage ascended and descended. Nystagmus, Mr. Snell thought, would probably be found associated with other occupations occasionally. Writers' cramp has been followed by the recognition of many similar conditions. The mention of this compositor's case would perhaps lead others to recognise more clearly the connection of nystagmus with occupation.

Immediate Loss of Sight of Both Eyes after Injury to Head.—Mr. Snell (Sheffield) related this case. The patient, aged 19, was on December 12th, 1890, crushed under a cage in a coal pit; the cage weighed 5 or 6 tons; it struck his head and then pressed him down, laying him out almost flat. He lost consciousness, and bled at the nose and ears; his face and eyelids were swollen, and when he could open the eyes the conjunctivæ were deeply ecchymosed. On recovering consciousness he found that he was perfectly blind, and he has remained so since. When seen first by Mr. Snell, on March 24th, the optic discs were decidedly whitened; but Mr. Jones, of Wath-on-Dearne, who had examined the patient with the ophthalmoscope between two and three weeks after the accident, was unable at that time to detect any definite change in the colour of the discs. Mr. Snell said the interest of this case lay especially in the loss of vision in both eyes. He alluded to Holder's important data as to the frequent implication of the vault of the orbit and optic canals in fractures of the base of the skull. In this case the fracture would be far forwards, and involved the optic canals or body of sphenoid; it would also damage the optic nerve or chiasma. The slow appearance of optic atrophy was mentioned as in accordance with experience when the injury to the optic nerve was behind the entrance of the central artery.

Albinism: A Curious Family History.—Dr. W. G. Sym (Edinburgh) sent notes of a family of seven children who were alternately albino and dark. The children, with the exception of the seventh, were all living, and in

good health. They had no mental defects. The parents and all other relatives had dark complexions.

Living and Card Specimens.—Mr. Silcock : Epithelioma of Upper Eyelid, Cheek, and Lip.—Mr. Cowell : Case of Acromegaly with Atrophy of Optic Nerves.—Mr. Critchett : Knife for Division of Membrane in Pupil after Cataract Extraction.—Mr. Treacher Collins : Intraocular Growth in a Blind Glaucomatous Eye.

Annual Meeting.—The annual general meeting was held at 9.30 p.m., and the following officers were elected for the ensuing year :—President : Henry Power. Vice-Presidents : James Bankart (Exeter) ; John Whitaker Hulke, F.R.S. ; John Hughlings Jackson, M.D., LL.D., F.R.S. ; William M. Ord, M.D. ; D. C. Lloyd Owen (Birmingham) ; H. R. Swanzy (Dublin) ; John Tweedy. Treasurer : George Cowell. Secretaries : Charles E. Beevor, M.D. ; A. Quarry Silcock. Librarian : W. Adams Frost. Other Members of Council : James Anderson, M.D. ; G. A. Berry, M.D. (Edinburgh) ; E. Treacher Collins ; F. Richardson Cross (Bristol) ; Henry Eales (Birmingham) ; Robert Marcus Gunn ; Gustavus Hartridge ; Frank H. Hodges (Leicester) ; W. H. H. Jessop ; Herbert William Page ; J. A. Ormerod, M.D. ; D. D. Redmond (Dublin).

PAPILLOMA OF THE CORNEA.

WITH REPORT OF A CASE BY DR. S. C. AYRES, CINCINNATI.*

It sounds somewhat contradictory to say that a papilloma can develop from a surface which is not naturally supplied with papillæ. At first it would seem to be impossible, but the vagaries of neoplasms are numerous, and this seems to be one of them.

Von Ziemssen, in Ziemssen's Archives, vol. VII., in speaking of papillæ of the larynx, says:—"The development of papillary growths occurs not only on the mucous surface originally provided with papillæ, but, as is especially shown by Virchow (*Krankhafte Geschwulste I.*, pp. 334 and following), also in regions where papillary structure of the mucous membrane is entirely lacking. The first step is the proliferation of the superficial connective tissue, the development of a little amorphous, granular, or homogeneous nodule, in which cells are not to be recognised until later. As the cells multiply, they gradually grow and put forth buds, just as is done by the pre-existing papillæ. The capillary loops of the papillæ are large; the surface of the neoplasm is covered with a thick layer of epithelial cells.

"The size and form of papillary tumours are very various. At first they represent little buttons or pegs; afterwards warty formations, as those representing a cock's comb; in case of luxuriant development, high

* Read before the Section of Ophthalmology of the American Medical Association, Washington, 1891.

growth similar to a berry, grape or cauliflower in form, which may partly or entirely fill the upper and middle, more rarely the laryngeal cavity."

Cornil and Ranvier say, in relation to the development of papillomata, "that mucous papillomata generally spring from the villi or papillæ of the mucous membrane, but they form where there are no papillæ—for example, in the ventricles of the larynx. The minute phenomena of these hypertrophies and new formations have not yet been followed very closely, but the analogy of their structure with that of inflammatory granulations supports the supposition that their mode of formation is similar." They say, further, as to location, that we find papillomata seated upon nearly all parts of the cutaneous and mucous surface.

Dr. Sajou, in his work on diseases of the nose and throat, says that "papillomata are wart-like growths occasionally found in the nasal cavities of young subjects. They are most frequently attached to the septum and to the inferior turbinated body. They vary in size from that of a lentil to that of a small chestnut, and present a very light brownish colour, with an irregular corrugated surface."

In relation to papillomata of the larynx, he says: "This class of growth does not present a characteristic appearance which enables a positive diagnosis to be made; they, however, possess certain properties in common which render an approximate recognition of the nature possible.

"They often present small round projections which cause them to be termed raspberry, mulberry, cauliflower, etc., because of their resemblance to them; they are usually located at the anterior portion of the larynx, and on the vocal bands near the anterior insertion."

Mackenzie, in his work on the diseases of the nose and throat, says that papillomata are by far the most frequent of all benign growths of the larynx. He also

says that papillomata are found in the nose, and are more common than is generally supposed.

Throughout the ophthalmic literature I see numerous reports of cancrioid. In the seventh volume of Graefe's Archives is a report by von Graefe of two cases of cancrioid of the cornea, which he scraped off, and which, from the description, resembled my case in its early stages, but it was composed of epithelial cells with very little connective tissue.

In the 14th volume of the same, Dr. Knapp reported two cases of cancrioid of the cornea and limbus conjunctivæ, but nothing is said of the microscopic appearance of the growths. Cases defined positively as papilloma are not very numerous in the literature at my command.

In the *Lyons Medical Journal* for 1879, M. Gayet reports a case of papilloma of the cornea. It was on the left cornea of a man 67 years of age. The growth was two years in reaching its present size, and had never caused much pain. It occupied four-fifths of the cornea, and left only a small portion of the periphery free, vision being only lateral and reduced to 1/60. The tumour, flat, and compressed by the action of the lids, was of a rose-grey tint, and presented a very characteristic appearance. Examined histologically, it was demonstrated to be a papilloma to the exclusion of sarcoma and epithelioma. It was treated by a powder of alum dusted on its surface with a hair pencil, and the result was surprising. It disappeared in the course of two months, and there was a restitution *ad integrum* of the cornea, and vision was increased to 1/4.

Berry, in his excellent work on "Diseases of the Eye," in speaking of tumours of the conjunctiva, says that of the non-malignant forms, perhaps the most common are papillomata. They usually occur as multiple excrescences from the conjunctiva at the inner angle of the eye in the region of the caruncle, but are found at the same time springing from the palpebral con-

junctiva. These surfaces are often uneven and crenated, but may also be smooth.

Pollock, in his work on histology of the eye, says that Sczokalsky has described a tumour arising from the limbus conjunctivæ in which the papillary processes, composed of spindle-shaped cells containing blood-vessels, were covered with a stratified epithelial layer.

Alt examined a growth of the conjunctiva in which there were epithelial papillæ, amongst and in the cells of which lay granules of pigment. In the transactions of the American Ophthalmological Society for 1879, Dr. William F. Norris, of Philadelphia, reports a case of recurrent papilloma of the corneo-scleral junction. It was in the person of a man 56 years of age. It was about half in the sclera and half on the cornea, and the tip of the growth extended to about the centre of the cornea. It was first dissected off and then cauterised. It returned, and in five months the operation was repeated. It was then cauterised with nitric acid, and this time successfully, there having been no return of it since.

At the meeting of the Ophthalmological Society of the United Kingdom, December 13th, 1883, Mr. Anderson Critchett and Mr. Juler exhibited a case of papilloma of the conjunctiva. It had been first noticed when the patient was nine years old, and she was now 14.

Schiess-Gemeuseus observed a case of papillary excrescence on the conjunctiva of both lids in a young man 17 years old. It had a whitish rough surface. It had existed for about six months. On the cheeks of the same side there was a lupus. The papilloma was treated by scarification and the use of silver nitrate in solution, and astringent applications.

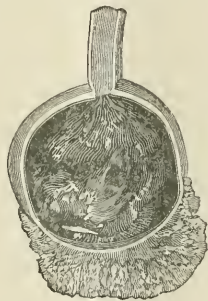
In the *Recueil d'Ophth.*, Jules Fontan reports a case of adeno-papilloma of the conjunctiva.

H. C. Boenning, in the *Philadelphia Medical Times*, reports a case of hairy papilloma of the conjunctiva.

Ewetzky describes a case of papilloma of the cornea

and conjunctiva in the person of a woman 50 years of age. It covered the entire cornea, except a part of the outer and lower quadrant. Upward and inwards from this tumour, and about 2·3 mm. distant on the conjunctiva, was another similar growth.

The case which I have to present was in the person of Mrs. K. G., *æt.* 50, a healthy, well-nourished woman, who was seen first on the 7th of May, 1889. There was a large growth on the anterior portion of the left eye, involving the entire front of the ball. It had the appearance of a cauliflower, and its edges spread out beyond its attachment to the globe. It projected 1 cm. from the sclera, and its horizontal diameter was



3·5 cm., and its vertical diameter 2 cm. Her history is as follows :

She says that six years ago she noticed some veins extending from the outer portion of the ball inwards towards the cornea, where there was a slight elevation on the sclera. This continued to grow and enlarge until about two years ago, at which time it was about as large as a small hazel nut. It was then removed by her physician, but it grew very rapidly, and he removed a portion of it every week or two.

He kept up this method of treatment for about six months, and then discontinued it. The tumour was allowed to grow unchecked until August, 1887. At that time it had grown to the size of a large hazel nut, and

protruded between the lids. It seems, however, that up to this time it had not encroached very far on the cornea, as she says she could still see very well. In August and September, 1887, it was operated on several times, a small portion being cut away each time. Since then it has been allowed to grow unchecked by any surgical interference (a period of twenty months), until it has assumed the proportions I have given above. There is no history of cancer in the family, and it has not been accompanied by pains which might be indicative of a malignant growth. It annoys her by its immense size and the consequent exposure of its surface to the air, as the lids do not completely cover it. I advised enucleation, as the eye was very unsightly, and there was no possibility of restoring any vision. To this she readily consented, and the globe was enucleated, without much difficulty, in the ordinary way. She made a rapid recovery, and since then, now two years, there has been no return of the growth. The specimen was examined for me by Dr. James M. French, who gave me the following report:—

“The specimen from the eye of Mrs. G., which you recently gave me for examination, proves to be a papilloma. Its structure consists of exceedingly delicate papillæ; which appear to spring from almost the entire anterior surface of the cornea. I have not yet been able to make an altogether satisfactory section of it, but I think that the growth must have originated from the conjunctiva, and that its presence upon the cornea is only an extension of the tumour upon its surface; for I cannot conceive the possibility of a papillary growth originating from a tissue like the cornea. I cannot state positively that the connective tissue of the central portion of the papillæ is, or is not, directly continuous with the corneal tissues, but such appears to be the case, the cornea having become vascular.

The only interesting feature microscopically of the tumour, apart from that to which I have just referred,

is the very long, slender, and delicate character of the papillæ, which appear to be primary.

I have not yet been able to find any secondary offshoots, and, if any are present, they originated at, or very near to, the apices of the primary papillæ. The central fibrous framework of the papillæ is very delicate, and supports little more than a single layer of columnar epithelial cells, without a well-marked corneal layer. The tumour was, of course, benign in character.

In this case there seems to be no doubt as to the microscopic structure of the growth, its distinctive histological characteristics being beyond doubt. I regret I am not able to present to you more confirmatory reports of parallel cases."

POINTS IN THE TREATMENT OF LAMELLAR CATARACT.*

BY CHARLES WRAY, F.R.C.S.

These cataracts appear to be extremely rare in infants and very young children, probably because they are not looked for unless so dense as to cause a whiteness of the pupil.

A cataract that reduces vision to $\frac{3}{4}$ produces only a slight milkiess, certainly not sufficient to attract attention in the small pupil of an infant. Happily, however, this is of no consequence, for an emmetropic eye that can see $\frac{3}{4}$ is not likely to become amblyopic, as is proved by the vision after the removal of the lens.

If, however, in an infant with an undilated pupil, it

*Read before the meeting of the British Medical Association, at Bournemouth, July, 1891.

is impossible to obtain even a coarse view of the fundus, treatment is called for, and atropine should be instilled to expose clear lens. If, then, the fundus can be seen even indistinctly, vision is not less than $\frac{3}{60}$, and the bi-weekly use of atropia would render the occurrence of amblyopia, such as occurs in the highest grades of astigmatism, very unlikely, and therefore operative measures may be deferred until a suitable age. If, on the other hand, it is impossible to see the fundus on account of spicules or dots, and the image obtainable by the indirect method is exceedingly blurred, the wisest course would be to remove the lens, at any rate, in one eye, and that by discission.

If there is no reason to apprehend the development of amblyopia, operative measures, to be as safe as possible, should be deferred until the intelligence of the patient is likely to supplement the efforts of the surgeon, seeing it is so difficult to carry out the after-treatment in young children.

At the age when cases usually come for aid, the two primary considerations are the prognosis of the case, and, *par excellence*, the requirements of the individual.

If dark glasses, by dilating the pupil so as to expose clear or comparatively clear lens, give the necessary improvement, and the cataract is of the non-progressive kind, they may be prescribed, and weak mydriatics for the special occasions upon which they cannot be worn. It is necessary, however, to remember that they are proscribed in many professional and commercial pursuits, and exclude domestic servants from the best situations.

Mydriatics also answer in a certain percentage of the cases. They are apt, however, to become dangerous in middle life, and attract attention to the eyes.

When glasses and mydriatics, or the two combined, are negatived by the disabilities they entail, or when, on account of the prognosis of the case or the in-

adequacy of vision, something must be done, operative treatment is called for, and it is necessary to determine whether it should be monocular or binocular.

Assuming the visual acuity equal in the two eyes, if the patient has and is likely to have enough sight for all requirements, save when now and again special vision is demanded, and the operation is one capable of giving the desired improvement, there would appear to be no reason for operating on each eye. In the event of the non-operated eye being for all practical purposes useless, the binocular operation may be justifiable or even called for.

The next step is to determine whether a piece of iris should be excised or the lens removed.

As iridectomy pre-supposes the periphery of the lens and cornea the equivalents of their centres, and it is exceptional for it to improve vision beyond $\frac{6}{18}$ (*i.e.*, it leaves the eye amblyopic and unequal to the requirements of even domestic life), removal of the lens would appear more desirable, especially as the cataracts may at some future time become total.

If, after removing one lens, the other eye is useless, the removal of both lenses would be legitimate, and especially if the patient lived in a crowded city.

When the monocular operation has been performed the patient uses the aphakial eye only for special purposes, and glasses are to be worn simply on those occasions; + 10 D., if the eye is emmetropic, will answer all purposes by withdrawing the spectacle frame on the nose for distances less than infinity. When the double operation has been done, the same glass may be used for each eye for constant use and withdrawn from the eye for special requirements, though reading glasses are more satisfactory if the patient has very much close work to do.

The above remarks apply to patients under or about 30. Above this age few persons with zonular cataracts come under our care, probably because they

consider they have enough vision for the position in life into which they have drifted.

In middle life, if the maximum dilatation of the pupil improves vision sufficiently for the patients' needs, an iridectomy should be done, as it is safer than discission, artificial maturation, or peripheral capsulotomy. If it fails to do so the more formidable operations are necessary.

Schweigger considers the discission of immature cataracts admissible up to 40, above which age he advises Foerster's operation, but is silent as to the value of peripheral capsulotomy.

From 30 to 40 the alternatives are discission and the opening of the capsule with excision of a broad piece of iris.

Probably up to 35 the safest course would be to break down the lens and capsule thoroughly with a needle, and remove the *débris* in the usual way.

Above that age peripheral capsulotomy would probably be safer.

About 45, Foerster's operation becomes practicable, but its place in the treatment of zonular cataract will depend upon a comparison of the results obtained with those of the operation known as Tweedy's or Gayet's.

The youngest case in which I have seen lamellar cataract was in an infant about six week old (Mr. Stanford Morton's case). The oldest were patients aged 40, 55, and 72.

The three following are the most interesting of the cases that have come under my notice during the last three years :—

1. A shop girl, aged 19, who could see sufficiently despite her cataracts, except for matching cloths. She informed me that her employer would most certainly object to her wearing glasses. Under the circumstances, especially as her cataracts were of the non-progressive kind, I advised a uniocular operation, and instructed her to use her glasses as mentioned above.

2. The patient with one eye saw $\frac{6}{36}$, with $-1.50D., \frac{6}{12}$; with the other $\frac{2}{60}$, with $-4D., \frac{6}{36}$. Ophthalmoscopic examination showed a small crescent in the less myopic eye, and a very large one in the other. Although there was a transparent zone, it seemed in the interests of the patient to remove the cataract from the more myopic eye. The operative result was perfect, but the ophthalmoscope showed a superficial atrophy of the choroid travelling towards the macula, and the vitreous, with $+20 D.$, was seen to be full of very small floating opacities. Vision after operation, with $-4D., \frac{6}{18}$.

3. A boy aged 17. The vision with the pupils in shade was $\frac{3}{60}$. No glasses improved beyond $\frac{6}{18}$. The cataracts were of the non-progressive kind, but large. The details of the fundus could be made out fairly well, and each disc was seen to have a large crescent on the outer side, the diameter of which was equal to about half, or rather more than half the papilla. As the patient could see J.I without glasses, and nearly $\frac{6}{18}$ with, I hesitated to recommend an operation. It was, however, done elsewhere.

The points I wish to accentuate are: (a) in a large number of cases unocular operations suit the patients' requirements better than the binocular ones; (b) an operation is necessary at least on one eye when vision is less than $\frac{6}{18}$, and the patient is a domestic servant; (c) glasses for near vision are unnecessary, except for prolonged use of the eyes.

E. G. LORING (New York). *Text-Book of Ophthalmoscopy*, part 2. *D. Appleton & Co., New York*, 1891.

The first part of this work appeared more than five years ago, and was briefly noticed in our pages at the time (*OPH. REV.*, vol. V. p. 52). In April, 1888, the talented author died suddenly, before the completion of the second volume. Fortunately, however, he had already made notes and drawings nearly sufficient for the completion of his work, and these the present editor, Dr. F. B. Loring, has published, as he tells us, almost without addition or correction, preferring to leave something undone in the way of elaboration and finish rather than to run the risk of misinterpreting the author's meaning or statements. The volume before us, like its predecessor, is remarkable for the minuteness with which every part of the subject is elaborated, both by means of the author's own clinical experience and by reference to the writings of others.

Chapter I., comprising nearly 120 pages and 32 illustrations, deals with changes in the vascular system of the retina, *e.g.*, with pulsation, with changes in the diameter and length of the vessels, with variations in the colour of the blood, with changes in the light-streak and in the walls of the vessels, with the formation of new vessels in the retina and in the vitreous, with aneurism of the retinal arteries, with visible circulation, ischæmia, and spasm, and with embolism and thrombosis. The changes produced by hæmorrhage within the several sheaths of the optic nerve are discussed. Retinal hyperæmia is considered under various distinctive titles, *e.g.*, central, capillary, static, collateral, atonic, and neuro-paralytic. Cyanosis, hæmorrhage, anæmia simple and pernicious, and atrophy of the retinal vessels are also separately dealt with. Among the many points which might be noticed in this chapter the question of diagnosis between embolism and thrombosis is, perhaps, one of the most interesting. So long ago as 1874 Dr. Loring urged that many of the cases commonly diagnosed as embolism,

i.e., stoppage of the circulation by the importation of a plug formed at a distance, are really cases of thrombosis, the cause of which is to be found in the mechanical actions which regulate the supply of blood within the eye, and upon the conditions of the walls of the vessels. The same opinion is here strongly maintained, and the differential diagnosis between the two conditions is fully discussed (see OPH. REV., vol. III. p. 8).

Chapter II. deals briefly with "irritation of the retina," the chief symptoms of which simulate those of asthenopia from errors of refraction, *e.g.*, fatigue, periods of dimness, pain over the brow, accompanied, in some instances, by dizziness and nausea, with dread of light. The condition underlying these systems is described as a form of congestion which stands midway between simple hyperæmia of the retinal vessels and actual inflammation. The process appears to be limited to the finer vessels and capillaries, the larger vessels presenting no visible changes. The changes described as discoverable in the colour of the retina are very subtle, and would perhaps be hardly admitted to be distinguishable with certainty by other ophthalmoscopists. In Dr. Loring's opinion these changes often precede atrophy of the nerve. The treatment of this condition, whether by tonics, glasses, electricity, or partial or complete tenotomy, is often unsuccessful. The cause is often seated in some other part of the system, and success in treatment is chiefly to be hoped for by those practitioners who "turn their attention from the prescribing of glasses, with almost imperceptible degrees of curvature, to the medication of the real seat of the disease."

Chapter III. deals with the inflammation of the retina in general, and two chief types are distinguished—the sthenic and the asthenic, the former usually having its seat, or at least its origin, in the inner layers of the retina, where the larger vessels lie; while the asthenic form takes its rise in the outer, and proceeds towards the inner layers. In the following chapter various forms of retinitis are described in detail, both in relation to their character, *e.g.*, diffuse, circumscribed relapsing central, punctate, hæmorrhagic, and in relation to their causes, *e.g.*, syphilis, renal disease, diabetes,

oxaluria, leukæmia, septic embolism, etc. Detachment, commotion, rupture, cystic degeneration, and damage by exposure to intense light are also discussed.

In Chapter V. the various forms and causes of optic neuritis are discussed, especial attention being drawn to loss of sight in connection with pregnancy and uterine disorders. A case of Dr. Loring's was probably the first in which premature delivery was ever performed for the sole purpose of preserving the sight, this end being happily attained, as it has been in many subsequent cases also.

Atrophy of the optic nerve, in its several varieties, is discussed in Chapter VI., and the final chapter is devoted to diseases of the choroid. In this last section only is it obvious that the author had not been able to complete his work.

At the end of the volume are 14 admirable coloured plates of the fundus oculi, nearly all of which were drawn by the author, and throughout the whole volume hardly less admirable drawings in black and white illustrate the various conditions which are described in the text. The work is a most valuable contribution to ophthalmic literature, and will remain a fitting monument to an eminent and talented surgeon, who, unhappily for our art, has passed away.

E. RÆHLEMANN (Dorpat). Primary New Growth of Hair on the Free Margin of the Lid as the usual Cause of Trichiasis. *v. Graefe's Archives* XXXVII. 2.

Normally on the free margin of the lids no hairs are to be found, and, indeed, when hairs are elsewhere developing in the embryo the lids are still joined together by their margins. Sebaceous glands, or glands in any way connected with hairs or hair-follicles, are also absent from this part. Under pathological conditions, however, hairs may be found here; this condition is known as trichiasis. According to a few authors, these abnormal hairs are congenital (Steilwag), or

develop in childhood (O. Becker), or develop about the time of puberty ; but most authorities state that trichiasis is a consequence of cicatricial contraction in the lids, by which the hair-follicles of the cilia become displaced, and their openings are given a new direction (Stellwag, Michel, Fuchs).

With neither of these theories does Raehlemann agree. He does not believe trichiasis to be congenital, as he has never seen it in children under 10, and rarely in people under 20. In nine-tenths of his cases it comes on as the consequence of the severe marginal blepharitis which is caused by granular conjunctivitis ; in fact, about half the severe cases of granular conjunctivitis suffer from trichiasis. No one familiar with the appearance of the disease can believe, according to Raehlemann, that in all these cases the trichiasis hairs are displaced cilia, and he gives an illustration of a lid in which this is obviously not so, the cilia remaining much as in a normal lid, while the free lid margin, whose shape is not lost, is dotted over with fine hairs. These must be new hairs, and may be developed as offshoots (*Sprossen Bildung*) from the follicles of the cilia (secondary development), or from the cuticle of the free margin (primary development).

In ophthalmic literature the author found no explanation of the origin of these "false cilia," except a suggestion of Unna, that they are caused by a development from the follicles of the cilia ; but this, though accounting for those hairs whose position is nearly normal though their direction be false, will not account for the hairs which are far removed from the true cilia, and are often growing in a quite normal direction. The author believes that such hairs are developed from the epithelial covering of the lid margin, and has arrived at this conclusion from the study of a large series of sections of lids affected with trichiasis, the material being mostly procured by operative interference. From a developmental point of view, a proof that this were so would be interesting, as the opinion of embryologists seems about equally divided as to the possibility of a post-fœtal new development of hair from the epidermis.

In the sections hairs in all stages of such a development were found, from the first dipping in of the epithelium to the

formation of a papilla, and of the so-called primitive hair bulb, and it was also seen that the root-sheaths of the trichiasis hairs were quite unconnected with one another or with the roots of the true cilia, more than a dozen cases being examined to determine this point. It was also found that the more recent the trichiasis, the more certain was it that such rudimentary hairs were to be seen. Illustrations of 13 sections, representing the development of a trichiasis hair, are given.

In Raehleemann's sections, the early development of the papilla is noticeable, and also that sebaceous glands, in whose cells sebaceous change has occurred, are formed in connection with the follicle before the development of the hair. Schulin believes that this occurs also in the embryo, but Rölliker states that these glandular changes do not take place till the young hair breaks through. The depth and direction of the roots of the trichiasis hairs are very variable, and seem much affected by the cicatricial tissue present in these cases. All the usual processes of growth and renewal may be seen in them, as in the hair follicles of other parts.

It is known that trichiasis occurs usually in connection with that form of marginal inflammation which so often occurs in the later stages of severe granular ophthalmia, and the author describes carefully the blood supply of the lid, showing that there is a close connection between the vascular supply of the conjunctiva and that of the free margin, whilst that of the roots of the true cilia is rather connected with the blood supply of the tarsus, and in this way he accounts for the fact which he has noticed, that the margin of the lid is generally involved in severe conjunctival inflammation, while the roots of the cilia are generally not disturbed, unless there be also a tarsitis.

In the later stages of granular conjunctivitis there is hyperæmia and thickening of the free margin of the lid, which becomes red and thickened. Soon this inflammation becomes of a proliferating type, connective tissue being formed, and the epithelial layers (malpighian) increasing in thickness, and the papillæ in number, and it is of this latter stage that the primary development of hairs is, in Raehleemann's belief, a part.

J. B. S.

GREEF (Berlin). Report of 450 Simple Extractions of Senile Cataract. (*From Prof. Schweigger's Clinic.*) *Archiv. of Ophthalm.* XX. 3.

The object of this report is "not to construct brilliant statistical tables, but to compare the results *in the same clinic* of the simple and the combined methods of cataract extraction." From this point of view the article is of interest and importance. The tables are, without exception, compiled from hospital cases, and include all operations, even those performed by the assistants in Schweigger's absence. The sight was tested usually about the twentieth day when the patient was discharged from hospital, and, unless for any exceptional reason, was not tried again. In the first few cases of simple extraction the section was made downwards—entirely in the corneal tissue—with a Beer's triangular knife. Later, Schweigger made his incision upwards, using a knife even broader than the ordinary Beer, but of the same general pattern. Capsular forceps were employed in the first series of operations, which form a group of 142 extractions; in 117 of these the section was made upwards, in the remaining 25 downwards. Reckoning V. = 1/6 as a good result, we have—

Perfect Success ...	...	104 = 73.3 %
Secondary Cataracts ...	...	30 = 21.1 %
Losses ...	...	8 = 5.6 %

A farther operation was performed in 16 of the 30 secondary cataracts, giving improved sight in every case but one, and in eight bringing vision up to 1/6; these last may, therefore, be included in the list of successes. Of the losses, three were due to infection of the section, one to hæmorrhage into the anterior chamber, one to a low form of irido-choroiditis, and one to prolapse of iris followed by irido-cyclitis. The remaining two might fairly be excluded, as they were both complicated, one with old leucomata of the cornea, and the other with central choroiditis.

Prolapse of iris occurred nine times, and in every instance but one the prolapsed portion was removed. The table showing the result attained in these cases is interesting. We give it in full.

1. $V. = \frac{6}{24}$.
2. $V. = \frac{1}{9}$, later $\frac{6}{36}$, still later $\frac{6}{12}$.
3. $V. = \frac{6}{12}$, later $\frac{6}{9}$, Schweigger's type 0.4 at 25 cm.
4. $V. = \frac{1}{24}$, astigmatism ; no further notes.
5. $V. = \frac{1}{12}$, later $\frac{1}{9}$.
6. $V. = \frac{1}{12}$, later $\frac{1}{9}$.
7. $V. = \frac{1}{6}$, later $\frac{6}{18}$.
8. $V. = \frac{1}{12}$, macula of cornea.
9. $V. = \frac{6}{18}$, later $\frac{6}{12}$.

A previously published list of 122 combined extractions at Schweigger's clinic (*Archiv. of Ophthalm.*, vol. xvi., p. 263) may with advantage be noticed here, as offering a good comparison with the series of simple operations given above. Thus :—

Successes ...	...	...	89 = 72.9 %.
Secondary Cataract	...	...	27 = 22.2 %.
Losses ...	...	...	6 = 4.9 %.

The similarity of result shown by these two tables is noteworthy, more especially when it is remembered that the operator in both groups of cases was the same.

The next series of extractions without iridectomy numbers 235, all performed with a broad knife—incision downwards—and v. Græfe's cystotome. The result is :—

Complete Success...	...	185 = 79 %.
Secondary Cataract	...	39 = 16.2 %.
Losses ...	...	11 = 4.8 %.

Of the secondary cataracts, 10 were further improved by needling to $V. = \frac{1}{6}$, and others were materially benefited. There were 20 cases of prolapse of iris, but further details of these are not given.

Analysis of the first 50 simple extractions done this year gives the following table :—

Complete Successes	36
Secondary Cataract, Astigmatism, etc.	12
Losses	2

But the V. of 7 out of the 12 secondary cataracts was eventually brought up to 1/6. Four cases of prolapsed iris occurred among these 50, two of which were complicated with capsular cataract. V. in these was respectively 1/9, improving later without interference to $\frac{6}{18}$; $\frac{1}{12}$ improving to 1/6; $\frac{6}{24}$ not seen again; and $\frac{1}{10}$ with capsule to be needled afterwards.

With reference to prolapse of iris, the author does not believe that this accident "is always associated with repeated attacks of iritis, or that iritis is more frequent after simple extractions than after extractions with iridectomy," and he lays stress on the fact that iridectomy certainly does not preclude the possibility of prolapse. Out of 451 simple extractions, prolapse occurred 35 times (7.9 %). Of these, 9 were so small that they were left alone; the remainder were removed. The further history of these cases has not been inquired into.

We may conclude our reference to this paper by quoting the two following tables:—

Of 371 cases of extraction *with* iridectomy the results are:—

Successes	278 = 75.1 %
Secondary Cataracts	71 = 19.2 %
Losses	22 = 5.7 %

Of 450 cases of *without* iridectomy, we have:—

Successes	346 = 76.5 %
Secondary Cataract	84 = 19.1 %
Losses	20 = 4.4 %

We presume it is unnecessary to say that, although strongly in favour of the simple operation, Schweigger has no intention of denying the advantage of iridectomy in many cataract extractions.

N. M. ML

SALZMANN (Vienna.) A Contribution to the Study of the Tumours of the Lids. *Archiv. of Ophthalm.* XX. 3.

This is a report of three cases of adenoma of the lids, each having developed from a different variety of gland. The preparations are from Prof. Fuchs' collection.

I.—A.P., *æt.* 80, came to the clinic on January 5th, 1887. She said that a year previously she had noticed a little lump about as large as a pin-head in the middle of the left upper lid. On admission there was a tumour about the size of a walnut hanging over the left palpebral fissure, and involving nearly the whole of the upper eyelid. The growth was in parts as hard as cartilage, in other places softer, the surface irregularly both smooth and rough, colour yellowish, and the whole adherent to the skin. The lymphatic glands in the neighbourhood were not enlarged. The tumour was removed on January 7th, and healed perfectly.

After hardening in Muller's fluid, sections were cut through its middle, and also at its outer part, the margin of the lid being completely involved in the former, but partially preserved in the latter portions. The skin showed no important changes; the subcutaneous tissue was somewhat thickened, and lay immediately over the capsule of the growth, distended veins marking the limits of the two structures. The conjunctiva was thickened, abnormally vascular, and showed hypertrophied papillæ over the tumour, but only slight infiltration over such portions of the tarsus as remained healthy. The most obvious changes were in the tarsus, which was much thickened in its upper part. The Meibomian glands were normal in its lower portions; further up they were small and somewhat compressed, "and still higher up the acini were replaced by lobules of the tumour, which at the sides lay in the normal tarsal tissue, and in the middle passed over into the mass of the tumour." The growth itself consisted of a collection of irregular, branching and anastomosing lobules, which were separated by connective-tissue septa, and a connective-tissue capsule surrounded the entire structure. The lobules were of

different sizes, but much larger than the normal acini of the Meibomian glands; they were composed of a mass of round or oval cells, without any intervening supporting tissue, and had no blood-vessels. Degenerative changes had begun in several parts of the growth, but were perhaps most marked about the centres of the large lobules. Between the lobules and the septa were numerous cavities, usually empty, or containing a little amorphous *débris*; these the author takes to be lymph spaces, "the analogues of those surrounding the acini of the normal Meibomian glands."

Salzmann thinks that the microscopic character of the growth makes the following points clear as to its origin and development, viz. (1) that it appeared in the first instance in the upper part of the lid internal to the middle line, and that a part spread thence downwards and outwards, while the larger mass perforated the tarsus, and extended subcutaneously over the fornix, and also forward in the inter-muscular tissue, replacing almost completely both this and the fibres of the orbicularis; (2) that "the acini, filled with cells, and having a lumen only where the central portions have degenerated, are of the type of Meibomian glands." This latter opinion is confirmed by the evident transformation of the normal acini into lobules of the new growth.

II.—S. D., *æt.* 65, was first seen in March 1887, with a tumour of the left upper lid, springing from the conjunctival surface of the upper portion of the tarsus. The margin of the lid was normal. The growth was as large as a cherry, its surface rough and very dark in colour, and it bled very readily. It was removed and hardened in Müller's fluid.

The capsule of the tumour was directly continuous with the tarsal tissue, which split to enclose it. The tumour consists of numerous branched and anastomosing glandular tubules, which are separated by connective-tissue septa. These tubules vary in form and size, and consist of a smooth epithelial wall enclosing a lumen of various width. No *membrana propria* could be detected. The stroma of the growth is formed by a loose connective-tissue, in which numerous round cells are scattered. The vessels are, as a

rule, in immediate proximity to it ; but here and there in the septa are irregular cavities, lined with endothelium, and containing blood.

From the microscopic examination it may be safely affirmed that this new growth had its origin within the tarsus, and its glandular structure points to its development either from the Meibomian glands or the acino-tubular glands. The author thinks the latter view much the more probable.

III.—A. S., *æt.* 42, was admitted to Professor Arlt's clinic in May, 1880. The swelling of which she complained was first noticed twenty-five years before. The tumour, which was in the inner half of the left upper lid, was 27 mm. long, 23 mm. broad, and 20 mm. thick. It was removed, and a small piece examined microscopically. The capsule was of thin connective-tissue ; but a well-marked septum passed inwards from it, dividing the tumour into two parts, both parts being typically glandular in structure, although in one the greater amount of connective-tissue present made the appearance less characteristic. The smaller part has "a central cystic cavity, from which pass in all directions branched tubules with blind rounded ends." Two layers of cylindrical cells line the inner surface of the cyst and tubules, those of the outer layer being smaller than the inner ones. Except for the excess of stroma, the larger division showed a very similar appearance to that of the smaller portion. The writer believes that the origin of the growth was in the modified sweat-glands of Moll.

N. M. ML.

AMERICAN MEDICAL ASSOCIATION.

SECTION OF OPHTHALMOLOGY.*

MEETING AT WASHINGTON, MAY, 1891.

Chairman : Dr. LEARTUS CONNOR, of Detroit.

The Centrad in the Reformed Numeration of Prisms.—Dr. B. A. Randall, of Philadelphia, urged the value of this unit for the new system of designating prisms by their

* For first part of this report, see previous number.

refracting power. While the name may be new, and is better so as to avoid confusion, the taking of the radius as the unit, in terms of which are designated all the functions of arcs and angles, forms the basis of all our trigonometrical tables. In its relation to the metre angle it has all the advantages of the prism-dioptre, and with a closer approximation to absolute accuracy. Half the inter-pupillary distance is the sine of the metre angle, not the tangent as seems implied by Dr. Burnett (See January number of the *OPHTH. REV.*), and stated by Jackson; the centrad measured on the arc is therefore a better approximation than the prism-dioptre measured on the tangent. Simply by laying off the proper scale of tangents it can be measured with the same apparatus as the other unit. The centrad is also applicable, as the other unit is not, to the designation of the direction of the axis of cylindrical lenses, or the limits of the visual field.

Subsequently the Section endorsed as the unit prism one that should produce a deviation of one centimetre at the distance of one metre in the rays of light passing through it. This is practically the centrad, and it also corresponds to the prism-dioptre for angles so small that the tangent may be regarded as coincident with the arc.

Astigmatism contrary to the Rule, and Associated Symptoms.—Dr. G. E. de Schweinitz, of Philadelphia, had analysed one hundred cases of this class, and found that more than half of them occurred between the ages of forty and sixty years. He concluded: That the associated symptoms were not more severe when the astigmatism was against, than when it was according to the rule as to the direction of the meridian of greatest curvature. That useful results follow the correction of the least degrees of measurable astigmatism, not otherwise obtainable; and the presence of normal central vision, according to the ordinary standards, does not preclude the presence of astigmatism which ought to be corrected. That ocular health is conserved by such careful attention to astigmatism, and so-called reflex disturbances are alleviated; but these latter should not be ascribed solely to astigmatism, for relief may be obtained by measures directed toward a constitutional vice or an

insufficient nervous tone. That the importance of insufficiencies of the ocular muscles cannot be estimated until the effect upon them of complete correction of the astigmatism has been obtained. That while in careful hands excellent results may be obtained without prolonged mydriasis, a most essential benefit is the local sedative influence of the mydriatic and the prolonged paralysis of the ciliary muscle that its use entails, these being required for the subjection of symptomatic retino-choroidal disturbance, in the presence of which the most perfect correction placed before the eye fails to fulfil its function.

Weak Cylinders for the Relief of Eye-strain.—Dr. J. J. Chisolm, of Baltimore, found it necessary to recognise and correct very small degrees of astigmatism. Headaches after eye use, with acute vision, usually indicate the presence of astigmatism of low degree; and the lesser degrees of astigmatism cause the more severe headaches. The reading of Jaeger I, or distant vision of $\frac{20}{20}$, does not prove freedom from astigmatism. Often it is present when no evidence of it is given by the fan of radiating lines; and the use of cylinders as weak as 0.25 D. will give great relief in many cases.

Double Monocular Diplopia.—Dr. J. H. Thompson, of Kansas City, reported a case occurring in a married lady, aged 34, who had been stunned and cut in the fronto-temporal region in a railway accident. At first she had homonymous diplopia from pressure on the scar, and paresis of the left external and superior recti muscles. Later, she saw double with either eye alone, the images being distinct and separated diagonally upward and to the right. Tested at various distances and in different ways, her account of the phenomena was consistent. Central vision was $\frac{20}{200}$, and there was great contraction of the visual fields. There were no ocular conditions to account for the impairment of vision, or the diplopia. There seemed to be no other evidence of traumatic hysteria. The case was thought to be hysterical in its nature, as are most of the cases of the sort on record. The condition has, however, been noted as a symptom of organic cerebral disease. As a localising symptom, it probably points towards the occipital lobe.

Lessons from Refractive Cases.—Dr. Geo. M. Gould, of

Philadelphia, presented statistics and conclusions from fifteen hundred cases seen in private practice. He found that upward of seventy-five per cent. of all headaches, and ninety-five per cent. of sick headaches, were due to eye-strain. To the same condition were also to be traced night terrors, unrestful sleep, incontinence of urine, and even disorders of digestion and assimilation, extreme hyperæsthesia and anæmia. He had never prescribed concave lenses of over fifteen dioptries. In many cases the full correction should not be given. As to heterophoria, while considerable amounts of exophoria might be disregarded, esophoria and hyperophoria require more careful correction. Two cases of hyperophoria with unilateral ptosis were cured by the use of lenses and prisms.

Graefe's Doctrine of Antipathy to Single Vision.—Dr. Geo. T. Stevens, of New York, stated his disbelief in anything like a physiological antipathy to single vision. He thought the phenomena to be accounted for were due to the unequal tension of corresponding ocular muscles under equal nerve impulses. They are caused mainly by two conditions. First, the condition is acquired as the result of operations for squint, through the unequal setting back of similar muscles of the two eyes, without any harmonious adjustments of the impulses under which they have to act; second, it is due to differences of tension in the muscles that act vertically. No adjustment of the eyes should be considered final without taking into account the relative positions of the images formed on the retinæ of the two eyes; and whatever alteration of a muscle is practised on one eye, should also be done on the corresponding muscle of the other eye. He found the operations for the correction of squint among the most difficult and delicate in ophthalmic surgery. In many cases the squint is not connected with ametropia at all, but rather with conditions of congenital amblyopia.

Hæmorrhagic Glaucoma.—Dr. R. L. Randolph, of Baltimore, reported three cases. In the first, a woman aged 52, there was sudden failure of vision in the left eye, and three days later it was found reduced to counting fingers at six feet, with numerous hæmorrhages in the fundus, and

tension normal. After twelve weeks glaucoma pain came on, tension + T 2, one fresh, and several old hæmorrhages. Eserine and the use of dry heat gave relief for two days. Then iridectomy was done, and gave relief for three weeks. But the pain returned, and paracentesis of the vitreous was done and repeated twice. Since the last operation there had been no pain, a period of six months having now elapsed. Second, a woman aged 44, after labour, had vision reduced to light perception, hæmorrhage in the fundus, and vitreous cloudy. Two months later glaucoma developed. Eserine having no effect, iridectomy was done, but the eye had to be enucleated one week later. In the third case, the patient, aged 77, subject to rheumatism, had retinal hæmorrhages and vision = $\frac{20}{60}$. Ten weeks later he was attacked with great pain, and reduction of vision to light perception, and all the symptoms of acute glaucoma. Paracentesis of the vitreous was done and repeated in ten days, but fresh hæmorrhages occurred, and the eye had to be enucleated.

Eserine and Iridectomy in Chronic Glaucoma.—Dr. G. E. de Schweinitz believed that it is proper to operate in cases of chronic progressive glaucoma after the patient has been warned of the nature of the disease and the uncertainties which beset surgical interference. As under certain circumstances it was impossible to operate, the action of eserine and pilocarpine on the eye was discussed, and a series of diagrams exhibited indicating the influence of these drugs upon chronic simple glaucoma. The first case was one of simple glaucoma, without any special rise in tension or alteration in the anterior portion of the eye. His charts showed gradual widening of the fields of vision in all particulars, so much so that there was a complete restoration of a previously lost portion in the upper and temporal segments, the only remaining portion of contraction being found upon the nasal side, which also had lessened. This patient was under observation for nearly a year. The chief interest attaching to the case was that there had never been any increase in tension, although the typical appearances of a glaucomatous disease were present in the eye-ground, and it seemed to demonstrate that, even in the absence of decided elevation of intraocular tension, eserine has power to

improve the nutrition of the eye and cause a restoration in a contracted field. In a second case of chronic glaucoma, with numerous subacute attacks, the points of interest were the long continuance of the disease (two and a-half years), without very great loss of vision, the frequent subacute attacks which resulted in reasonable cure under the influence of eserine, the form which the fields of vision assumed in one of these attacks, namely, that of almost complete left lateral hemianopsia, which, under the influence of the drug, gradually widened out until the lost field was restored and the entire field assumed practically the same proportions which it had before the attack. In a third case diagrams of the fields of vision were exhibited, showing, in spite of eserine, the steady progress of chronic glaucoma towards blindness, until there was only a small patch about ten degrees wide remaining on the temporal side. The effect of iridectomy in simple chronic glaucoma, when it yields a good result, was graphically illustrated by a series of charts before and after iridectomy. The original loss of the field had been complete in the supero-nasal quadrant, while six months after the iridectomy the central vision remained as good, if not a little better than preceding this, while there was a gradual improvement in the visual field and a partial restoration of perception in a previously entirely darkened area. Incidentally the value of full doses of strychnia in temporarily controlling chronic glaucoma, and of the physiological action of chloral in full doses in lessening intraocular tension, were referred to, one of the cases having apparently been benefited by the latter.

Comparative Mydriatic Effect of Homatropine and Atropine.—Dr. H. M. Starkey, of Chicago, reported the results of comparative tests in twenty-five cases. The homatropine was instilled five times in fifty minutes, and the refraction tested. Shortly afterwards atropine was used in the usual manner for periods ranging from one day to five weeks. In fourteen cases there was no change in the result with atropine. In two there was some change in the refraction in the first twenty-four hours, none later. In three there was no change in the first twenty-four hours, but change after that. In six there was change both on the first day

and subsequently. The changes were usually but 0.25 or 0.50 D., and in the majority of instances the atropine produced the fuller mydriasis.

Dr. Ayres read a paper on "Papilloma of the Cornea." (See page 257.)

Enucleation for the Relief of Insanity.—Dr. H. Moulton, of Fort Smith, reported the case of a man who had lost an eye when six years old by caustic alkali. At the age of twenty eight the eye became inflamed and the lens escaped. He was now forty, and had been suffering for over a year with intense headache and increasing melancholia. Enucleation of the injured eye gave complete relief, which lasted many months.

Irido-dialysis.—Dr. Eugene Smith, of Detroit, had treated four cases by the following method with complete success: A narrow incision was made in the sclero-corneal junction close to the centre of the region from which the iris had been torn. The detached margin was then seized and drawn into the incision, which grasped it and retained it in position. In one case a suture had also been added to make sure of its proper retention, but this would rarely be necessary. In one case it was thus made fast at two points instead of one. The operation has been followed by no bad results, and has given complete relief.

Fluorescein and Fluorescin.—Dr. F. T. Smith, of Chattanooga, called attention to the value of solutions of these substances in the diagnosis of abrasions of the cornea, or to show the extent of a corneal ulcer, difficult to inspect on account of photophobia, or the presence of a foreign body, or to determine the permeability of a stricture of the lachrymal duct.

The next annual meeting of the Association will be held at Detroit, commencing on the first Tuesday in June.

THE ACTION AND USES OF PRISMATIC COMBINATIONS. *

BY ARCHIBALD PERCIVAL, M.A., M.B., B.S. Camb.

There are two physical conditions which are essential for the binocular (single) vision of a point :—

(1) The retinal images must be definite.

(2) These images must be formed on corresponding areas of the retina; in other words, each eye must be directed towards the same point.

If the first condition fail, owing to some refractive error greater than that which the muscle of accommodation can correct, dimness of sight is usually the only complaint. When, however, the disproportion between the accommodative power and the refractive error is slight, symptoms of headache and accommodative asthenopia arise from the fatigue induced by the strenuous efforts made by the ciliary muscle to compensate for the defect.

Similarly, in anomalies of the directing muscles of the eye, when the defect is great, no effort is made to correct it; there is no headache, and patients only complain of strabismus and diplopia. Indeed, if the strabismus is well marked, the diplopia is not a troublesome symptom, as the false image falls on a peripheral and relatively insensitive part of the retina. Hence the patient soon learns to neglect or suppress this dim

* Read at the Annual Meeting of the British Medical Association, held at Bournemouth, July, 1891.

image, and his chief trouble is his difficulty in recognising the position of objects, and even this is generally but a temporary one. But if his defect is slight, a diplopia may arise of the most annoying description, for two objects appear to exist, which are both clear and well defined, and which yet seem to overlap each other, owing to the fact that their images are formed near the maculæ, in those parts of the retina in fact where vision is most distinct. There is, therefore, a very strong desire for fusion of these retinal images, and binocular vision is sometimes maintained by an excessive innervation of the affected muscles, which produces in its turn symptoms of giddiness and headache, and these are generally associated with certain others of the neurasthenic type. If the muscular tension is relaxed even for a moment, double vision occurs, entailing a psychical perplexity which is no less distressing to the unfortunate sufferer.

The symptoms, then, of muscular asthenopia are most accentuated when the want of balance in the ocular muscles is slight, and prisms or prismatic combinations would at first sight appear obviously the rational means of correcting all these muscular defects. Such indiscriminate treatment has, however, proved far from successful, and many ophthalmic surgeons, disappointed with their results, have abandoned the use of prisms, and thrown discredit upon them. It is not unusual, indeed, now to hear operative measures advocated in the strongest terms for all cases.

In the present paper I wish to point out some of the causes of failure, and to indicate those conditions in which we may reasonably hope for a successful issue by ordering prisms or prismatic combinations. The disrepute into which they have fallen is due, I believe, very largely to an imperfect recognition (1) of their precise action; (2) of the special conditions for which they may be appropriately prescribed. There are, however, still deeper causes at work also. The fundamental

principles of treatment are still undetermined; there is no uniformity of opinion as to the ideal condition at the production of which we are aiming in our correction of muscular anomalies. Add to this the inexactitude of diagnosis consequent on subjective tests, and our

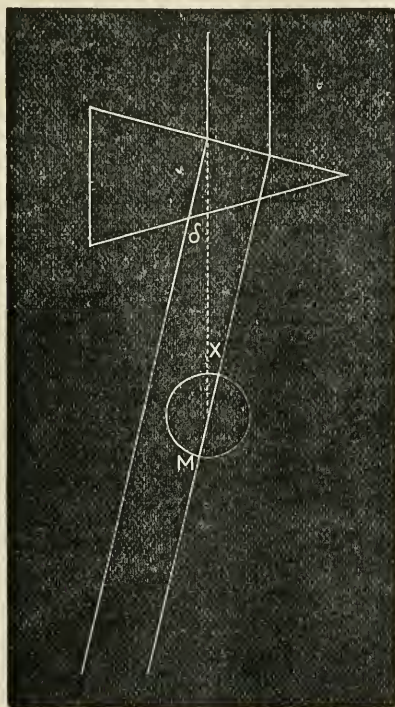


FIG. 1.—Parallel rays, after traversing the prism, undergo a deviation δ . The eye has consequently to turn through an angle X in order to receive one of these rays on its macula. The angle X is equal to the angle δ .

successes will seem to demand more explanation than our failures.

The action of plane prisms is too well known to call for more than passing notice. It is very simple when they are designated by their refractive power.* Their

* This suggestion was originally made by Dr. Jackson, and it is now ably supported by Dr. Landolt and many other leading ophthalmologists.

effect on the eye is, of course, identical with that on luminous rays (Fig. 1). "A strabismus of 15° requires a prism of $15^\circ d$ to correct it; when a diplopia is corrected by a prism of $10^\circ d$ it corresponds to a strabismus of 10° , and so on."*

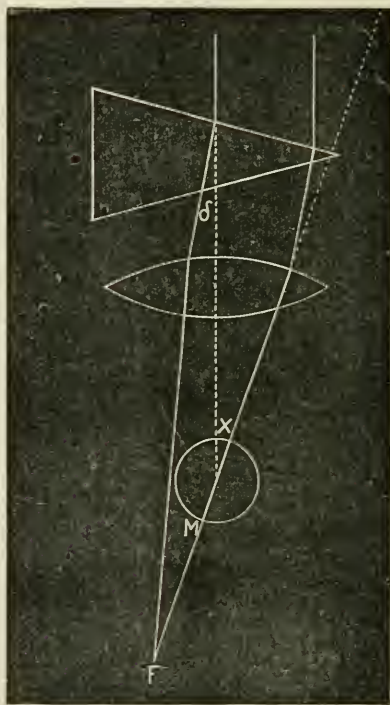


FIG. 2.—Parallel rays of light on traversing the prism as before undergo a deviation δ . On reacting the lens, since the pencil of rays is oblique, they will converge to the (secondary) focus F, which is not on the principal axis. The visual line must consequently undergo a deviation X. The ray of light which it receives on its macula passes through an eccentric portion of the lens, which therefore acts as an additional prism. Accordingly in this case X is greater than δ .

When, however, a spherical lens is used in conjunction with the prism, this simple relation no longer

* Vide paper by Dr. Landolt, "On the Numbering of Prismatic Glasses," *Knapp's Archives of Ophthalmology*, vol. xix., No. 4, p. 498.

obtains, for we have now to remember that the visual line traverses an eccentric portion of the lens, so that the deviating effect of this potential decentration must also be taken into account (*vide* Fig. 2). This complication necessarily also arises when the two glasses are

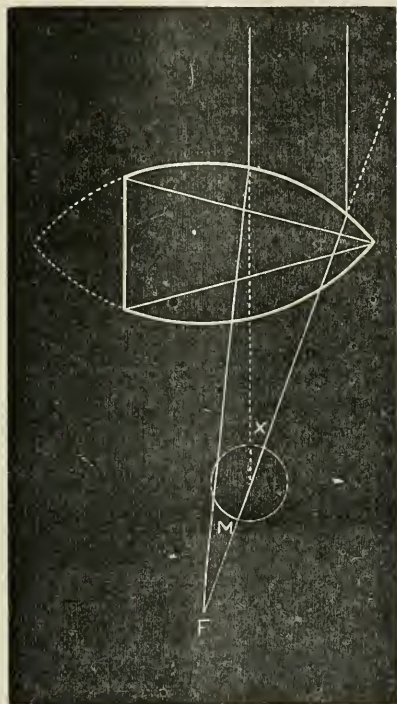


FIG. 3.—The position of the prism does not affect the result, even if it is put inside the lens, as in a prismosphere the deviating effect is the same. The angle X has the same magnitude as in Fig. 2.

fused into one prismosphere or decentred lens (*vide* Fig. 3). Dr. Ernest Maddox, two years ago, alluded to this peculiarity of prismatic combinations. He pointed out that when concave prismospheres were used, the effect on the direction of the ocular fixation lines was always less than that of the prism; but that when convex combinations were used, their action was greater

or less than that of plane prisms, according as the distance of the object was greater or less than the focal length of the lens. Unfortunately he went no farther, and he did not determine the extent of this difference of action. It is obvious that prismatic combinations cannot be prescribed with any attempt at scientific precision until this point is determined. I will not now weary you with the mathematical solution of the problem, which I have published elsewhere (*Knapp's Archives of Ophthalmology*, vol. xx., No. 2). The result may be expressed in the following form: If the prismosphere be regarded as a lens of focal length, f , which is decentred to the extent of d millimetres, where X represents its deviating action:—

$$\tan X = \frac{d p - f m}{f p - k (p - f)}$$

k is the distance of the glasses from the ocular centres; m represents half the distance between the ocular centres corresponding in adults usually to a distance of 32 millimetres; p denotes the distance of the object from the glass.

When the lens is concave a negative value must of course be given to f , so that the formula becomes

$$\tan X = \frac{d p + f m}{f p + k (p + f)}$$

I have drawn up a series of tables for reference by assigning their respective values to the variables in these formulæ. They were published in the original communication, but I venture to insert them also in this paper. These tables enable one to determine the extent to which a lens should be decentred, or, in other words, the prism with which it should be combined, in order to produce a given deviation, and, *vice versa*, the exact action of a prism when used in conjunction with a lens. It will be found, for instance, that a prism of $5^{\circ}30' d$, when combined with a convex lens of $+9 D$, has the

same deviating effect as a plane prism of $7^{\circ}17'd$. To induce, however, this deviation in a myopic eye of -9 D, a prism of $9^{\circ}4'd$ would be required, if used in association with a concave lens of -9 D.

When investigating the condition of the ocular muscles, we are frequently obliged to use a combination of lenses and prisms.* A considerable error of diagnosis may be introduced by neglecting the deviating effect of the lens in the combination. It is hoped, therefore, that these tables will aid in securing greater accuracy in diagnosis.

What, now, are the special conditions for which they may be appropriately prescribed?

The general proviso may be made that the muscular defect must in all cases be limited in extent: as is well known, prisms of more than $2^{\circ}d$ cannot be worn with comfort, owing to their weight and the chromatic aberration which is necessarily entailed. Slight errors, however, frequently induce a train of most distressing symptoms, especially, perhaps, in cases of hyperphoria.

It will be advisable, however, to consider the deviations in the vertical and horizontal planes separately.

The term Hyperphoria has been introduced by Dr. George Stevens to express that condition in which there is a want of balance between the muscles which elevate and depress the globe—where, in fact, there is a tendency of one visual line above the other. Dr. Stevens has done much to elucidate these faulty tendencies of the ocular muscles,† but he advocates operative

* Thus in determining the absolute minimum of convergence, the patient should be provided with glasses which enable him to define some distant object without exerting his accommodation. The strongest abducting prism compatible with single vision when held before these glasses enables one to find the minimum of convergence, with the help of the tables which are appended.

† "The Anomalies of the Ocular Muscles," by Dr. George T. Stevens, *Knapp's Archives of Ophthalmology*, vols. xvi., xvii., xviii.

procedures somewhat too unreservedly in my opinion.*

I believe that prisms, which correct the defect completely, will be almost always successful in these cases, as the error in each eye rarely exceeds 2° ,† and is generally much less; and the order can of course be given with less compunction if the patient is already condemned to wear glasses to correct his refractive errors. In such cases, of course, attention must be paid to the complication introduced by the lenses, and the prescription must be made out in accordance with the formulæ given above, or the result will not improbably be disappointing.

The tendencies to deviation in the horizontal plane—viz., esophoria and exophoria—require somewhat closer study. There are two classes of cases of this nature, which must be carefully distinguished, for their successful treatment depends on this discrimination:—

(1) Those characterised by feebleness of one or more of the muscles with which is associated an impairment of movement.

(2) Those in which the range, though not contracted in extent, is in an unavailable situation; in such cases, indeed, the amplitude of the movement is often greater than normal, yet symptoms arise owing to the fact that the position of minimum tension—the zero point, if one may so describe it—is not that consistent with parallelism of the visual axes.

Mannhardt, indeed, in opposition to the prevalent opinion of his time, assumed that all defects were of this nature; he stated that the range of convergence was practically constant, and was represented by an angle of 24° . Dr. Landolt, to whom we are chiefly indebted

* Cf. also Dr. White's reference to this subject, in his address on "The Supposed Curative Effect of Operation *per se*," *Brit. Med. Journ.*, July 18th, 1891.

† If there be hyperphoria to the extent of 4° , it may be regarded as a deviation of 2° upwards in one eye, and 2° downwards in the other.

for our knowledge of this subject, gives from $18^{\circ}30'$ to 24° as the normal amplitude of convergence. We may take, then, 18° as the physiological limit, below which the range of convergence cannot fall without indicating feebleness of the directing muscles of the eye.

In the first class of cases, *i.e.*, those due to muscular weakness, prisms to *relieve* the defect should never be given if cure of the affection is the object in view. Progressive deterioration of the condition, necessitating repeated alterations in the glasses, is almost invariable if this line of treatment is pursued. It is, indeed, wholly wrong in principle: exercise, not rest, should be enjoined for all weak muscles. The successful treatment of flat foot and of lateral curvature consists in a systematic exercise of the feeble muscles. Similarly we should endeavour to strengthen the feeble ocular muscles by gymnastic exercise with prisms, which excite them to contract, as suggested by Dr. Dyer. It is true relapses are liable to occur if these exercises are given up too soon, but I believe that, with perseverance, ultimate success is almost certain.

It is not unusual to prescribe prisms which correct part (one-half) of the defect, and to order them to be worn constantly, so that a feeble stimulus may be continuously supplied to incite the sluggish muscles to contract more energetically. Surely our experience in other regions of the body teaches us the lesson that the alternation of rest and activity short of exhaustion is more favourable to nutrition and growth than continuous exertion. This method would seem, therefore, far inferior to that of Dr. Dyer.

It sometimes happens that our object is not to cure the affection; I refer to certain paralytic cases which we accept as incurable. In such, if the error be not too great, prisms may be ordered to correct the diplopia, and the patient may be permitted to wear them constantly. Not cure of the disease, but relief of the symptom is here our object; and even this can only be

obtained over a relatively small area of the whole fixation field, "for the relations of the double images become entirely different in its different parts; and it is impracticable to adapt the prisms to these changes," as has been pointed out by Dr. Noyes.

It is then chiefly, in the second class of cases, in those in which the range of movement is represented by an angle of 18° or more that prismatic combinations may be ordered to be constantly worn, and here they are only applicable when the error is not greater than 2° in each eye. If, for instance, the maximum divergence be 4° , instead of the normal 2° , and the maximum convergence be 15° , abducting prisms of $2^\circ d$ may be prescribed, which will have the effect of placing the range in a more available situation; in fact, its limits will now be -2° and $+17^\circ$. Should the patient be a hypermetrope of $+5 D$, prismatic combinations of $+5 D$ convex with $1^\circ 44' d$ will be sufficient, as the deviating action of this combination is the same as that of a plane prism (*vide* Table I.) of $2^\circ d$.

If the defect exceed the stated limit of 2° , tenotomy of the preponderating muscles is indicated.*

I have here assumed that muscular errors, due to displacement of the range, should be corrected by altering its position to such an extent that the far point of convergence may occupy its normal site. It remains to be seen whether this assumption is justifiable. The question now opened up is a difficult one, and demands detailed investigation.

Even after the most careful examination of the condition of the ocular muscles, comprising the measurement of the relative range, both when the accommodation is relaxed and when it is exerted for the working distance,

* Tenotomy has the disadvantage of diminishing the amplitude of movement, so that unless the range is of the normal extent, advancement of the feeble muscles would be preferable, as by that means the range is increased in amplitude, while it is also rendered more available by the alteration of its position.

as well as the localisation of the (absolute) far and near points of convergence, we still have to determine what condition we wish to induce before ordering prismatic combinations for that purpose.

Is the ideal condition at which we should aim that of rest, or merely that in which fatigue is avoided? The functions of accommodation and convergence are so associated in their action that if the former is called into play, no effort is required in maintaining the latter. Indeed, the dissociation of their action occasions considerable strain and fatigue. The condition of rest does not, therefore, imply inactivity. In the normal state, when the eyes are accommodating for a point at a distance of $\frac{1}{3}$ metre, they tend also to converge to the same point. This is indicated by the maintenance of that degree of convergence, even when binocular vision is rendered impossible.

On the other hand, it would appear a legitimate presumption that a certain fraction of the amplitude of convergence may be brought into continuous activity without causing fatigue. Our aim may therefore be to provide that no more than this share shall be exercised by the patient.

The methods which we adopt to determine the degree of error which is to be corrected depend obviously on the condition we wish to induce.

A.—If the object in view be to avoid all effort.

(1) The faulty tendency which manifests itself as a deviation by Graefe's dot and line, or Dr. Maddox's glass rod test, may be measured. The test should be applied with the object of fixation at the working distance ($\frac{1}{3}$ metre), as well as at a distance of 6 metres. Any lenses which the patient may require must be first provided, and then prisms must be found which will correct the deviation. Prismospheres can then be ordered which will have the same effect as this combination.

I find that with many patients it is impossible to

determine the extent of the diplopia exactly, as the false image is continually shifting, so that this method does not in all cases give accurate results.

(2) The relative range of convergence may be determined after the correction of refractive errors, both when the accommodation is relaxed and when it is exerted for the working distance. Now it may be presumed that the mid point of the relative range represents that degree of convergence which occasions the least strain with the given amount of accommodation. Donder's diagram (for the emmetrope) affords some support for this presumption. This method is given by Dr. Ernest Maddox;* it is more complicated, but admits of greater exactitude than that previously given.

B.—If, however, exemption from fatigue is to be the aim of treatment, we have to determine what degree of effort can be maintained without fatigue. Now, according to Dr. Landolt, not more than one-third of the total power of convergence can be continuously exercised without inducing symptoms. This at once suggests an easy method of dealing with the subject of muscular asthenopia, if the premises can be accepted. There seem, however, to be two sources of error:—(i.) The ratio borne by that portion of convergence which can be exercised to that which must be kept in abeyance may, and probably does, vary with different degrees of accommodation; in fact, it is the relative, and not the total, range of convergence which must be taken into consideration. (ii.) Patients are found to present individual differences as to their power of maintaining a continuous effort. This tolerance cannot be expressed as a constant fraction of the total power, the ratio must vary in different individuals.

C.—The other method that may be suggested is to give such prisms as shall make the far point of

* "The Clinical Use of Prisms," p. 81, by Dr. Ernest Maddox.

convergence assume its normal position. Dr. Landolt appears to adopt this principle as a guide in determining the extent of his operations on the ocular muscles. Its simplicity is certainly in its favour; it is, indeed, comparable to the method well known in the treatment of refractive errors, which is based on the correction of all the manifest hypermetropia.

In deciding on the merits of these various methods, we must take into consideration a further complication involved by the relation of the functions of accommodation and convergence. We know that hypermetropes who do not squint acquire a facility for accommodating without converging. Myopes, again, acquire an extraordinary power of converging without accommodating. It seems not unreasonable to suppose that a similar disturbance of the relative range of accommodation may obtain with the subjects of muscular anomalies. For instance, a patient whose power of divergence is indicated by -5° (instead of -2°) may acquire a special facility in overcoming part of this divergence without accommodating. The question then arises, Does this abnormality of the relative range, once acquired, remain constant; or will it disappear after the correction of those defects which have presumably induced it? If possible, is it desirable to obtain this result? The answer to this question has an important bearing on treatment. If we regard this abnormal relation as one that can and should be cured, we would correct all the refractive and muscular errors, and trust to the relative ranges of accommodation and convergence adjusting themselves to the new conditions. We should, in fact, put r_d and r_c in their normal positions by prismospheres that would correct all the hypermetropia, and that would make the maximum power of divergence be represented by -2° (*Cf.* Method C).

If, however, this abnormal relation be incurable, or if it should be allowed to remain, the errors of refraction or those of convergence must only be partially corrected

to avoid symptoms arising from its persistence (*Cf.* methods *A* and *B*). *

The solution of these questions is urgently needed, as the very principles of treatment are involved in them. Indeed, a complete investigation of the strengths of the ocular muscles, and their functional relations to different degrees of accommodation, demands such prolonged and repeated examinations that they would be quite impossible to carry out in practice with each patient. It is imperative, therefore, to determine what are the points to which we may confine our attention.

I have dealt with this complicated subject at some length, so that its difficulties may be clearly stated and fairly faced. They can only be solved by data furnished by clinical experience. I have latterly adopted the procedure of correcting all the refractive error, and so much of the convergence defect as will enable the eyes to maintain their necessary direction without calling for special exertion (*A*). I have met with some success by acting on this principle, but my experience is not yet large enough to justify me in giving expression to a dogmatic opinion. It is at such a meeting as the present that there is an opportunity of throwing light on the obscurities of the subject by free discussion, based on clinical observation. It is most desirable that further progress should be made in rendering the methods of dealing with muscular asthenopia more precise and scientific. It is obviously to the absence of such precision and accuracy that the not uncommon failure in treatment is to be traced.

(*) In *A* the abnormality of the relation is allowed to persist in its entirety, but in *B* only in part.

EXAMPLES ILLUSTRATING THE USE OF THE TABLES.

TABLE I.—A hypermetrope of + 8 D and esophoria 1 ma at 6 metres will have this convergence defect corrected by decentering the 8 D lens 3.1 mm. outwards, or, what comes to the same thing, by associating it with a prism of $1^{\circ} 26' d$ (not $1^{\circ} 50'$).

TABLE II.—A patient requiring + 12 D glasses for reading, who can only maintain convergence for a distance of $\frac{1}{2}$ metre (2 ma), must have his glasses decentered 4.6 mm. inwards.

TABLE III.—A myope requiring - 6 D for reading, who can only maintain 2 ma. of convergence, must have his glasses decentered 4 mm. outwards, or combined with a prism of $1^{\circ} 24' d$, which is practically the same thing. Table II. and Table III. are useful also in estimating the relative range of convergence for reading distance. A myope using - 5 D for reading can obtain binocular vision with a 3° prism held edge inwards before each eye, as well as with a $12^{\circ} 32'$ prism held edge outwards. His relative range is not, however, represented by $15^{\circ} 32'$, but by $12^{\circ} 46'$, or 7 ma.

TABLE I.

		CONVEX.																	
		1 D	2 D	3 D	4 D	5 D	6 D	7 D	8 D	9 D	10 D	12 D	14 D	16 D	18 D	20 D			
+ ma.	7°17'	124.5 7°6'	60.5 6°54'	39.1 6°42'	28.5 6°30'	22.1 6°18'	17.8 6°6'	14.7 5°54'	12.5 5°41'	10.7 5°30'	9.3 5°11'	7.1 4°54'	5.6 4°30'	4.5 4°6'	3.6 3°42'	2.9 3°18'	Divergence decentration inwards.	“	Divergence decentration inwards.
	3 ma.	5°29'	93.3 5°20'	29.3 5°9'	21.3 4°53'	16.5 4°44'	13.3 4°35'	11.1 4°26'	9.3 4°17'	8.0 4°7'	6.9 3°59'	5.3 3°41'	4.2 3°23'	3.3 3°5'	2.7 2°47'	2.1 2°29'			
	2 ma.	3°40'	62.2 3°33'	19.6 3°28'	14.2 3°16'	11.0 3°9'	8.9 3°4'	7.4 2°57'	6.2 2°52'	5.3 2°45'	4.6 2°40'	3.6 2°27'	2.8 2°15'	2.2 2°3'	1.8 1°51'	1.4 1°39'			
1 ma.	1°50'	31.12 1°47'	15.121 1°44'	9.787 1°41'	7.121 1°38'	5.521 1°35'	4.454 1°32'	3.692 1°29'	3.121 1°26'	2.676 1°23'	2.321 1°20'	1.787 1°14'	1.405 1°8'	1.121 1°2'	.898 55'	.721 50'	Divergence decentration inwards.	“	Divergence decentration inwards.
	1°	16.975 58'	8.248 57'	5.339 55'	3.884 53'	3.011 52'	2.429 50'	2.014 48'	1.702 47'	1.460 45'	1.266 43'	.975 40'	.767 37'	.611 33'	.490 30'	.393 27'			
	0																		
1 ma.	1°	17.935 1°2'	9.207 1°3'	6.208 1°5'	4.843 1°6'	3.970 1°8'	3.389 1°10'	2.973 1°12'	2.661 1°13'	2.419 1°15'	2.225 1°16'	1.934 1°20'	1.726 1°23'	1.570 1°26'	1.449 1°30'	1.352 1°33'	Divergence decentration inwards.	“	Divergence decentration inwards.
	1°50'	32.879 1°53'	16.879 1°56'	11.546 1°59'	8.879 2°2'	7.279 2°5'	6.212 2°8'	5.450 2°11'	4.879 2°14'	4.435 2°17'	4.079 2°20'	3.546 2°26'	3.165 2°32'	2.879 2°38'	2.657 2°44'	2.479 2°50'			
	2 ma.	3°40'	65.75 3°45'	23.1 3°57'	17.7 4°4'	14.5 4°10'	12.4 4°15'	10.9 4°22'	9.7 4°28'	8.8 4°34'	8.1 4°40'	7.1 4°52'	6.3 5°4'	5.7 5°16'	5.3 5°28'	4.9 5°36'			
3 ma.	5°29'	98.6 5°38'	50.6 5°47'	34.6 5°56'	26.6 6°5'	21.8 6°14'	18.6 6°23'	16.3 6°32'	14.6 6°41'	13.3 6°50'	12.2 6°59'	10.6 7°16'	9.5 7°24'	8.6 7°42'	7.9 8°10'	7.4 8°27'	Divergence decentration inwards.	“	Divergence decentration inwards.
	7°17'	131.5 7°29'	67.5 7°41'	46.2 7°53'	35.5 8°5'	29.1 8°17'	24.8 8°26'	21.8 8°41'	19.5 8°52'	17.7 9°4'	16.3 9°16'	14.2 9°39'	12.6 10°3'	11.5 10°26'	10.6 10°50'	9.9 11°12'			

The object of observation is presumed to be at a distance of more than 6 metres from the patient.

The figures in larger type indicate the amount of decentration in millimetres.

The figures in smaller type represent the deviating power of the prisms whose action is equivalent to that of the decentration of the lenses.

DIVERGING.

X

CONVERGING.

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	1 D	2 D	3 D	4 D	5 D	6 D	7 D	8 D	9 D	10 D	12 D	14 D	16 D	20 D
4 ma. 7°17'	240.6 13°32'	118.5 13°20'	77.8 13°08'	57.5 12°57'	45.3 12°46'	37.2 12°34'	31.3 12°22'	27.0 12°11'	23.6 11°59'	20.9 11°48'	16.8 11°36'	13.9 11°24'	11.7 10°47'	8.7 10°21'
3 ma. 5°29'	206.6 11°40'	101.9 11°31'	67.1 11°23'	49.7 11°14'	39.2 11°06'	32.2 10°57'	27.2 10°48'	23.5 10°39'	20.6 10°31'	18.3 10°22'	14.8 10°14'	12.3 9°47'	10.1 9°21'	7.8 8°54'
2 ma. 3°40'	172.6 9°47'	85.4 9°42'	56.3 9°36'	41.8 9°30'	33.1 9°24'	27.3 9°18'	23.1 9°12'	20.0 9°7'	17.6 9°1'	15.7 8°55'	12.8 8°43'	10.7 8°31'	9.1 8°17'	6.9 7°56'
1 ma. 1°50'	138.6 7°53'	68.8 7°50'	45.6 7°48'	34.0 7°45'	27.0 7°42'	22.3 7°39'	19.0 7°36'	16.5 7°33'	14.6 7°30'	13.1 7°27'	10.7 7°21'	9.1 7°15'	7.8 7°9'	6.1 6°57'
0	104.6236	52.3118	34.8745	26.1559	20.9247	17.4372	14.9462	13.0779	11.6248	10.4623	8.7186	7.4731	6.5380	5.8124
	5°58'	5°58'	5°58'	5°58'	5°58'	5°58'	5°58'	5°58'	5°58'	5°58'	5°58'	5°58'	5°58'	5°58'
1 ma. 1°50'	70.6 4°02'	35.7 4°05'	24.1 4°08'	18.3 4°11'	14.8 4°14'	12.5 4°18'	10.8 4°21'	9.6 4°23'	8.6 4°26'	7.8 4°29'	6.7 4°30'	5.8 4°41'	5.2 4°47'	4.3 4°59'
2 ma. 3°40'	36.6 2°06'	19.2 2°12'	13.4 2°18'	10.5 2°24'	8.7 2°30'	7.6 2°36'	6.7 2°42'	6.1 2°48'	5.6 2°54'	5.2 3°0'	4.6 3°12'	4.2 3°24'	3.9 3°36'	3.5 3°48'
3 ma. 5°29'	2.6 9'	2.6 18'	2.6 27'	2.6 36'	2.6 45'	2.6 54'	2.6 1°3'	2.6 1°13'	2.6 1°22'	2.6 1°31'	2.6 1°49'	2.6 2°07'	2.6 2°25'	2.6 2°43'
4 ma. 7°17'	31.3 (1°48')	13.9 (1°36')	8.1 (1°24')	5.2 (1°12)	3.4 (59')	2.3 (47')	1.4 (35')	.84 (23)	— .36 (11)	.03 1'	.61 25	1.02 49'	1.3 1°13'	1.77 2°02'
Difference for 1 ma.	33.995 1°57'	16.558 1°54'	10.743 1°51'	7.839 1°48'	6.0957 1°45'	4.933 1°42'	4.1029 1°39'	3.4801 1°36'	2.9957 1°33'	2.6082 1°30'	2.0270 1°24'	1.6119 1°18'	1.300 1°16'	.8645 59'
Difference for 1°	18.54 1°3'	9.032 1°02'	5.861 1°0'	4.276 59'	3.325 57'	2.691 55'	2.2380 53'	1.8983 52'	1.6341 50'	1.4227 49'	1.105 46'	.8792 43'	7.093 39'	.5772 36'
														.4716 32'

The object of observation is presumed to be 3 metre from the centre of rotation of the globe.

The figures in larger type give the amount of decentration in millimetres.

—^{vs} sign indicates decentration outwards; +^{vs} sign decentration inwards.

The figures in smaller type represent the deviating power of the prisms whose action is equivalent to that of the decentration of the lenses. When enclosed in brackets the prisms are adducting in function, and should be placed edges inwards.

TABLE III.—(CONCAVE.)

	—1 D	—2 D	—3 D	—4 D	—5 D	—6 D	—7 D	—8 D	—9 D	—10 D	—12 D	—14 D	—16 D	—18 D	—20 D
4 ma. 7°17'	—247.6 13°55'	—125.6 14°6'	—84.9 14°17'	—64.5 14°28'	—52.3 14°40'	—44.2 14°51'	—38.4 15°2'	—34.0 15°14'	—30.6 15°25'	—27.9 15°36'	—23.8 15°59'	—20.9 16°21'	—18.8 16°43'	—17.1 17°5'	—15.7 17°27'
3 ma. 5°29'	—211.9 11°58'	—107.2 12°7'	—72.4 12°15'	—54.9 12°24'	—44.5 12°32'	—37.5 12°41'	—32.5 12°49'	—28.8 12°58'	—25.9 13°7'	—23.5 13°16'	—20.1 13°33'	—17.6 13°50'	—15.7 14°7'	—14.3 14°24'	—13.1 14°41'
2 ma. 3°40'	—176.1 9°59'	—88.9 10°5'	—59.9 10°11'	—45.3 10°17'	—36.6 10°23'	—30.8 10°29'	—26.7 10°35'	—23.5 10°40'	—21.1 10°46'	—19.2 10°52'	—16.3 11°4'	—14.2 11°15'	—12.6 11°27'	—11.4 11°39'	—10.5 11°50'
1 ma. 1°50'	—140.4 7°59'	—70.6 8°2'	—47.4 8°5'	—35.7 8°8'	—28.8 8°11'	—24.1 8°14'	—20.8 8°17'	—18.3 8°20'	—16.4 8°23'	—14.8 8°26'	—12.5 8°32'	—10.8 8°38'	—9.6 8°44'	—8.6 8°50'	—7.8 8°56'
0	—104.6236 5°58'	—52.3118 5°58'	—34.8745 5°58'	—26.1559 5°58'	—20.0247 5°58'	—17.4372 5°58'	—14.9462 5°58'	—13.0779 5°58'	—11.6248 5°58'	—10.4623 5°58'	—8.7186 5°58'	—7.4731 5°58'	—6.539 5°58'	—5.8124 5°58'	—5.2312 5°58'
1 ma. 1°50'	—68.9 3°56'	—34.0 3°53'	—22.4 3°50'	—16.5 3°47'	—13.1 3°44'	—10.7 3°41'	—9.1 3°38'	—7.8 3°35'	—6.9 3°32'	—6.1 3°29'	—4.9 3°23'	—4.1 3°17'	—3.5 3°11'	—3.0 3°5'	—2.6 2°59'
2 ma. 3°40'	—33.1 1°54'	—15.7 1°48'	—9.8 1°42'	—6.9 1°36'	—5.2 1°30'	—4.0 1°24'	—3.2 1°18'	—2.6 1°12'	—2.1 1°5'	—1.7 59'	—1.1 47'	—7.3 35'	—4.2 23'	—1.8 11'	.01 (1')
3 ma. 5°29'	2.6 (6')	2.6 (18')	2.6 (27')	+2.6 (36')	2.6 (45')	2.6 (54')	2.6 (1°3')	2.6 (1°12')	2.6 (1°21')	2.6 (1°31')	2.6 (1°49')	2.6 (2°6')	2.6 (2°25')	2.6 (2°43')	2.6 (3°1')
+ am. 7°17'	38.4 (2°12')	20.9 (2°24')	15.1 (2°36')	12.2 (2°48')	10.5 (3°5')	9.3 (3°12')	8.5 (3°24')	7.9 (3°36')	7.4 (3°48')	7.0 (4°)	6.4 (4°24')	6.0 (4°48')	5.7 (5°12')	5.4 (5°36')	5.2 (6°)
Difference for	35.754 2°53'	18.316 2°6'	12.594 2°9'	9.598 2°12'	7.854 2°15'	6.6016 2°18'	5.8613 2°21'	5.2385 2°24'	4.7541 2°27'	4.3667 2°30'	3.7854 2°36'	3.3702 2°42'	3.0588 2°48'	2.8167 2°54'	2.6229 3°
of refraction	19.502 1°27'	10.088 1°9'	6.820 1°10'	5.235 1°12'	4.284 1°14'	3.650 1°15'	3.1971 1°17'	2.8574 1°18'	2.5932 1°20'	2.3819 1°22'	2.0648 1°25'	1.8383 1°28'	1.6685 1°32'	1.5364 1°35'	1.4397 1°38'

The object of observation is presumed to be $\frac{1}{2}$ metre from the centre of rotation of the globe.

The figures in larger type give the amount of decentration in millimetres.

—ve sign indicates decentration outwards; +ve sign decentration inwards.

The figures in smaller type represent the deviating power of the prisms whose action is equivalent to that of the decentration of the lenses. When

TH. LEBER (Heidelberg). On the Origin of Inflammation and the Operation of the Agents which cause it. *Leipzig, Engelmann, 1891.*

This important work is the outcome of a long series of experimental researches carried-out by its author during the past 11 years. Its appearance has been awaited with much interest, and it will certainly not disappoint the expectations which have been founded on Prof. Leber's high scientific reputation.

The researches were directed to the solution of many different and intricate questions, *e.g.*, the operation, as excitors of inflammation, of the mould-fungi (*Schimmelpilze*), of the fission-fungi (*Spaltpilze*), of the toxic substances excreted by these organisms, and of many inorganic and organic substances; the influence of mechanical irritation; the migration of leucocytes in the inflamed cornea, the attraction of these cells by inflammation-exciting substances, and the causes of their emigration from the blood-vessels; the diffusion-power of microbic products and their operation through an intervening membrane; the microbic constitution and other characters of pus from the anterior chamber, the part played by leucocytes in suppurative destruction of tissues, and the production of new tissue by inflammation, etc. The experiments were made chiefly on the eyes of rabbits, less frequently on those of guinea-pigs and frogs, and for certain special purposes on parts other than the eye. For the purposes in hand the eye usually presented the most favourable field for experiment.

During the long period occupied by these researches Leber has from time to time published brief accounts of his results, and some of the earlier questions which he solved have in the meantime been studied and discussed by others, but if the present comprehensive work has thus lost something in the way of novelty, it has gained in certainty and completeness. We shall endeavour, in successive numbers of the REVIEW, to give some account of each main division of the book.

Part I. describes the inflammatory processes which are excited in the eye by the action of mould-fungi. Until lately it was supposed that the mould-fungi, which are commonly met with as parasitical growths on dead organic substances, do not develop and originate morbid processes in the healthy bodies of living animals; when found in the living body they were supposed to have settled there by reason of some previous disease of the tissue or decomposition of the secretion which contained them. Clinical observation gave no certain evidence as to this matter, and the earliest experiments undertaken with regard to it gave contradictory results. Leber was led to investigate the question by a case in which a wound of the cornea by an oat-husk led rapidly to severe hypopyon-keratitis, the necrotic cornea showing under the microscope free infiltration with the mycelium of a mould-fungus (*aspergillus fumigatus*). Cultivations of the fungus obtained from this case, and free from any admixture with other organisms, were employed in a series of inoculations of the corneæ of rabbits. Proof was obtained that this organism can develop freely in healthy tissue and excite severe suppurative inflammation.

The question of temperature in relation to this matter was carefully studied, and with interesting results. It was found that the inactivity of certain kinds of fungus when introduced into the living body, as compared with their free growth in dead tissue, depends largely upon the difference of temperature. For example, the two eyes of a freshly-killed rabbit were inoculated with spores of *penicillium glaucum*, the one being subsequently kept at a temperature of about 36°C., the other allowed to become cold. In the former the germs remained completely inert, while in the latter the fungus developed freely. The same difference was observed with cultivations in fruit-syrup. The *aspergillus fumigatus*, on the other hand, grew freely at the natural temperature of the body.

These and other experiments definitely proved that certain varieties of mould-fungus in their natural condition—that is, unaltered by artificial cultivations—can develop rapidly in the healthy tissues of men and animals, and, in so doing, set

up suppurative inflammation and necrosis, while other nearly related varieties have not this power. Other experiments have shown that these fungi may be introduced into the tissues in two ways, viz., directly through a wound, or indirectly by the blood or lymph currents, as after artificial injection into the blood-vessels and abdominal cavity. The latter mode is doubtless extremely rare, except in artificial experiments, and even the development of these fungi as a result of their accidental introduction through a wound is certainly rare also, for no other case than the one above referred to has come under Leber's notice. Their presence in the air-passages of the lungs and in the ear, whither they are carried in the form of dust by the process of respiration, is a matter of more clinical importance.

Apart from their direct practical interest, these observations concerning the effects of the mould-fungi upon the living cornea have proved of great value in the study of the inflammation-process in general. The large size of these organisms renders it comparatively easy to observe the exact limit of their growth, and thus to distinguish between the part actually invaded and the secondary changes which arise in adjacent parts; in other words, to distinguish between cause and effect in the inflammation-process. In the case of the much smaller fission-fungi this distinction is more difficult to make, in spite of recent improvements in the art of staining, and was still more so when these researches were begun.

It is impossible here to follow the author through the detailed description of the changes which followed inoculation of the fungi into the cornea, the anterior chamber, and the vitreous body. The following summary will serve to indicate the salient points, and the conclusions which are drawn from them.

In the inflammatory process excited in the cornea by inoculation with the aspergillus two points are manifest:—First, that the action of the fungus extends far beyond the region which it actually invades; and, second, that its action upon the invaded part differs from its action upon the surrounding parts. In the former it causes death of the tissue by necrosis, with only moderate inflammatory

infiltration ; in the latter it causes inflammatory reaction, with suppuration. The necrosis manifests itself by a rapid destruction and casting off of epithelium and endothelium in the invaded area. The reactive changes in the surrounding non-invaded tissue consist of purulent infiltration in the form of a ring surrounding the invaded area, and a wider infiltration of the corneal tissue with albuminous fluid ; inflammatory infiltration of the adjacent part of the conjunctiva, iris, and ciliary body ; purulent exudations into the anterior chamber ; and sometimes exudation on the posterior surface of the iris and into the vitreous body ; furthermore, to the formation of new vessels, and to repair of the epithelium and substance of the cornea. These changes, occurring in parts not invaded by the fungus-growth, must obviously be caused by some sort of remote action, and for the study of this phenomenon the non-vascular cornea offers a most favourable field.

With regard to the manner in which the cornea becomes infiltrated with pus no doubt can exist ; the pus gains access in the two ways established by Cohnheim. It enters the substance of the cornea directly through the inoculation wound, and it enters it also by migration from the blood-vessels of the conjunctiva at the corneal margin. The pus cells do not originate in the corpuscles of the cornea, for these show no sign of proliferation ; they are derived, in whichever way they enter, from the conjunctiva.

The ring of purulent infiltration which forms around the region occupied by the fungus is due to the aggregation of cells migrating thither from the vessels at the corneal margin, for during life a slight cloudiness at the margin of the cornea, especially at that part which is nearest to the inoculation wound, precedes the formation of the ring, and under the microscope it is evident that the cells have travelled thence towards the inoculated area, and have been arrested in their course, and thus crowded together at a short distance from it, the central limit of the ring being usually more sharply defined than the peripheral. Proof of this is obtained when the cornea is inoculated in two or more places at once. If the purulent infiltration began at

the points of inoculation, it would surround these latter on all sides, and would affect the centre of the cornea no less than the more peripheral parts ; if, on the other hand, it came from the corneal margin, it would approach the inoculation wounds from the outer side only. It is always found to do the latter.

The only reasonable explanation of the distant action of the fungus upon blood-vessels with which it is not in contact appears to be that it secretes some soluble substance which diffuses itself through the surrounding tissues, and, on reaching the neighbouring blood-vessels, acts upon their walls in such a way as to cause dilatation, exudation, and emigration of the white corpuscles. Seeing that the cornea has no blood-vessels, the only other possible explanation would be that some influence is transmitted through the nerves of the cornea, but well-known physiological experiments have shown that nerve action in the cornea is not essential to the process of purulent infiltration, and also that abolition of such action does not necessarily lead to such infiltration. The changes in question cannot be explained by any hypothesis of perverted or abolished function in the corneal nerves. This, however, is no denial of the fact that pus-corpuscles may sometimes be seen to travel along the nerve-spaces in the cornea.

The inflammatory reaction is most intense just at the points which would be most easily reached by a diffusible substance emanating from the fungus. Thus, in addition to the effects produced on the adjacent parts of the cornea, there is often a fibrinous exudation at the nearest point of the pupil-margin, and there is often much purulent infiltration of the ligamentum-pectinatum, the toxic material being carried no doubt in both cases by the aqueous humour. It appears, then, that the fungus secretes a toxic substance which acts upon the tissues with greater or less intensity according to its greater or less concentration. In the area actually invaded by the fungus it acts with full intensity, and causes necrosis of the tissues ; at a greater distance, its action being less intense, it causes inflammatory reaction a chief factor in which process is a local toxic paralysis of the blood-vessels. When the poisonous substance is caused to act with full

intensity upon a vascular tissue, as by the introduction of the aspergillus into the anterior chamber, the effect upon the vessels is proportionately severe, as evidenced by the profuse exudation of coaguable fibrinous fluid.

The escape of leucocytes is not, however, a merely passive change due to the altered condition of the capillary wall ; it involves active changes in the cells themselves, and it must be inferred that the toxic substance acts directly upon the contents of the vessels as well as upon the vessels themselves. Evidence of this is found in the behaviour of the leucocytes after their escape from the vessels. They arrange themselves, as already said, in a densely packed ring surrounding the fungus, but between this ring and the fungus there is usually a narrow free space, which they are unable to traverse, the explanation being, no doubt, that on coming within a certain distance they are paralysed or killed by the toxic substance, which acts here with greater intensity. This explanation, however, is not in itself sufficient to explain the dense aggregation of the corpuscles immediately outside the line at which their movement is arrested, or the fact that they make their way hither in opposition to the resistance of the corneal tissue. It cannot be supposed that a mere passive escape of leucocytes from the vessels at the corneal margin could lead to their crowding together in the neighbourhood of the fungus. The inference is inevitable that they are actively attracted by the latter.

The attraction-theory completely explains the changes which occur in the cornea ; it explains also the collection of pus in the anterior chamber, which many observers have felt obliged to attribute to a migration of pus cells from the cornea into the chamber, although the cornea itself produces no pus cells and Descemet's membrane is highly impermeable. It explains the fact that in the inflammatory exudations which coat the iris, and the portions of Descemet's membrane which are denuded of epithelium, the infiltrating leucocytes are most thickly crowded on the side which is towards the inoculated area.

A similar attractive influence appears to play a part in the formation of blood-vessels in the cornea, for the new vessels are always directed towards the centre of inoculation.

These facts raise the important question, to what extent do the changes induced in the cornea react upon, and antagonise the growth of, the fungus? A remarkable difference in this respect is manifest between non-vascular and vascular tissues. In the cornea, on the surfaces of Descemet's membrane and the lens capsule, and in the vitreous, the fungus grows readily until the reactionary inflammation is established. On the iris, on the other hand, the spores do not develop. Moreover, after injections into the blood the development in the various organs of the body is very much less active than in the non-vascular structures of the eye. It is unquestionable that vascular tissues present conditions unfavourable to the growth of the fungus, and it appears that the reason of this is that the growth is checked by the exudations from the vessels which it itself excites. The reactive inflammation in the tissues invaded is a preservative process, the effect being the arrest, destruction, and casting out of the invading organisms.

The power of leucocytes to take up and remove minute solid bodies—the *phagocytosis of Metschnikoff*—belongs no doubt to this order of phenomena, but in the case of the mould fungi there is no proof that the arrest of growth is effected exactly in this way. It is clear, however, that the ring of infiltration which forms around the invading fungus has the effect not only of checking the further growth of the fungus, but also of forming a line of demarcation around the necrosed tissue and promoting its removal.

P. S.

PINEL-MAISSONNEUVE (Paris). Ocular Symptoms in Acromegaly. *Arch. d'Ophtalmol.* July-August, 1891.

The patient, whose case is described in this paper, was a man *æt.* 37, in whom enlargement of the hands, feet, and head was first noticed at the age of 24. About the same time he suffered from severe cephalalgia. The deformity had slowly increased, while his general health remained good.

Exophthalmos came on gradually, with some discomfort and intra-orbital pain ; and the man noticed that his sight began to fail. When 30 years old the right eye suffered from an attack of keratitis, which left a slight peripheral scar ; when first seen by the writer he had just recovered from a kerato-conjunctivitis in the left eye, for which no obvious cause could be ascertained. For the last four years the condition, as regards the ocular symptoms, had been, so far as could be judged, stationary ; the exophthalmos had not increased, nor had the vision deteriorated further.

Backward pressure on the eyeballs gave rise to some pain, and the feeling communicated to the hand suggested that the protruded globes lay upon an elastic cushion formed by the hypertrophied fatty and cellular tissue in the orbit. No pulsation, or thrill, or murmur could be detected. By separation of the lids the eyeballs could be exposed in their entirety, and easily became dislocated through the palpebral fissure. The pupils reacted very slowly to light, more briskly with accommodation. The ocular movements were almost normal, though very slow. Colour vision was unimpaired, and the visual fields normal. Vision was in the right eye reduced to $\frac{1}{2}$, in the left to $\frac{2}{3}$.

Ophthalmoscopic examination showed, in both eyes, but especially in the left, marked papillary stasis, dilated and tortuous veins, slightly narrowed arteries, the edges of the disc a little blurred.

The author considers that the conditions found in the few *post-mortem* examinations which have been made in cases of acromegaly will sufficiently explain the ocular symptoms in his patient. The enlargement of the pituitary body, which has in some instances been considerable, has resulted in damage to the optic nerves or chiasma by pressure. In a case of Henrot the chiasma was flattened so that it measured only 1 mm. in thickness ; in an autopsy recorded by Fritsch and Klebs the pituitary body was as large as a "nut," and had compressed the optic nerves laterally. Finally, in a case reported by Schultze temporal hemianopsia was present.

J. B. L.

M. PERLES (Berlin). Partial Embolism of the Retina. *Centralblatt für prakt. Augenheilk.* August, 1891.

In this paper Perles takes advantage of four cases of partial embolism which have occurred to him lately to make some remarks on the retinal circulation, and the importance which the anatomical arrangement of the macular vessels has in diseases of the fundus. Indeed, it very largely determines the prognosis in cases of partial embolus.

The nutrition of the central part of the fundus depends, in the majority of cases, on two vessels, an upper and a lower, which take their origin from the central artery during its course within the nerve, so that they appear on the disc, somewhere near the edge, as isolated vessels, pursuing thereafter a nearly straight course. This type is frequently departed from, but there is always one artery belonging exclusively to the central part of the retina, although often the corresponding vein cannot be made out. Consideration of this arrangement shows that in embolic or other stoppage of circulation, the macula may escape any *direct* damage at least, provided such stoppage has its seat beyond (*i.e.*, peripherally to) the point of origin of the macular arteries. On the other hand, a central scotoma may be present, with the field of vision good, the scotoma extending upwards or downwards from the fixation point, according as the lower or upper artery is involved in the damage. That these statements are not merely theoretical, Perles proceeds to prove by relating his four cases, of which the following is a summary.

1. Woman, aged 30. A black spot was noticed on her nose, as the patient at first imagined, one morning twelve years ago, immediately after wakening. She readily convinced herself that there was nothing there, but the black spot has ever since been present in the field of the right eye. Ophthalmoscopically, one sees that the upper of the two arteries which run to the macula is embedded in a dull, greenish-grey, œdematous area which rises abruptly from

the surrounding retina, begins at the disc margin, and seems to pass quite to the fovea centralis, the vessel being here and there almost hidden in the œdema. There was no embolus visible, but it was no doubt a case of this disease affecting the superior macular artery. Vision, $\frac{1}{10}$; finest print, however, is read at 7 inches, but only when the patient looks very slightly upwards, not straight at the object. This is explained by the presence of a scotoma, semi-circular in form, of 8° extent in a downward direction, reaching quite to the fixation point, and partially damaging it. Some months later there was no pathological change visible in the retina, except a slight constriction of the superior macular artery over a short area, but the subjective condition was exactly as before. The patient probably had an aneurism of the arch of the aorta; urine was normal.

2. Woman, aged 28. Patient stated that sixteen hours before she presented herself the right eye had become blind. A white embolus was found to exist in the artery close to the origin of the upper chief branch, the nasal twig being thus completely closed, the temporal not completely so; a branch running upwards shows interruption of the blood-column with intermittent movements of it, not distinctly synchronous with the carotid pulse. Where it forms a fork, the current in one of the limbs is towards the heart, round the bifurcation, and into the other limb. The entire upper half of the retina is in a state of œdema, which reaches down close to the blood-red macula. There are two macular arteries: the upper arises by itself at the edge of the disc; the other from the trunk in the cup. V. = fingers at 1 metre. The field of vision is restricted in the lower outer part, an incomplete scotoma extending nearly to the fixation point. After energetic massage for three minutes moderate print could be read, but the field was not notably improved. On repetition of the massage on the following day, the finest print could be read. Massage was used daily for a time, the scotoma diminished, the embolus disappeared (on the 14th day), and the circulation returned; only the upward running arteries were thready. No heart nor kidney disease; varicose veins of legs.

3. Woman, aged 31. Sixteen hours previously she had had a rushing of blood to the head, by which the vision of each eye was temporarily lost. After a few seconds that of the right eye returned, and of the left also, but only imperfectly, and so it has remained. A white embolus was visible on the disc at the place of origin of the lower artery, obstructing the nasal branch slightly, the temporal branch completely. Up to the embolus the artery was full of bright red blood, beyond that point it was filled to various degrees at various places with dark blood. The veins were much expanded; no pulsation was visible even on pressure. The whole lower outer quadrant of the retina was œdematous, even to the dark red macula. An abrupt line of demarcation between œdematous and normal retina was formed by the tortuous inferior macular artery, which arises from the trunk in the cup, the superior appearing separately on the disc; both were normal. Patient could read small print, but the upper inner quadrant of the field of vision was lost. Massage was at once employed, with the result that the visible part of the embolus was much diminished, the arteries became better filled with brighter blood, but neither vision nor field was much improved thereby. The patient had suffered from rheumatism nine years before, which had recurred the year preceding the eye symptoms. There was mitral incompetence, well compensated. Urine normal.

4. Coachman, aged 44. Thirteen days previously, during an attack of acute rheumatism of four weeks' duration, he was suddenly seized with blindness of the right eye while lying quietly in bed in the middle of the day. On the day following this attack the vision was better, and had been improving ever since. On examination, an embolus of the lower branch of the central retinal artery was found; the temporal twig of the three which this vessel gives off being the one injured in this case. There was still some œdema within its area of distribution, fading away gradually towards the nasal side, but above ending abruptly along the course of the arteriola macularis inferiora, which, like the superior, arose out of the cup. The arteries of the lower half of the retina were all attenuated. An absolute

scotoma obliterated the upper half of the field of vision to about 5° from the fixation point. $V = \frac{1}{30}^5$; and fine print. The clinical account of the heart was very meagre, but the outline seemed normal; at the apex the first sound was somewhat impure. In all probability there had been recent endocarditis with vegetations and formation of soft white thrombi—the source of the embolus.

Perles adds to his paper two cases of embolism of the trunk of the central retinal artery, which showed after a time some appearances somewhat resembling those of albuminuric retinitis; and he concludes from the above four cases of partial embolism, and from the literature of the subject, that the important point in prognosis is:—Has the embolism plugged the macular vessels, or has it been carried past their (happily more central) origin, to be eventually dislodged and pushed onwards by massage?

WILLIAM GEORGE SYM.

BRITISH MEDICAL ASSOCIATION.

59th ANNUAL MEETING, BOURNEMOUTH, JULY, 1891.

SECTION OF OPHTHALMOLOGY.*

President.—N. C. MACNAMARA, F.R.C.S.

Opening Address on Certain Points in Ophthalmic Practice.—The President first considered the treatment of immature senile cataracts, and expressed an opinion generally favourable to their removal by operation. He also advocated the administration of a general anæsthetic in many patients over 65, upon whom extraction of cataract was to be performed. The second subject noticed was the relation of hypermetropia to glaucoma, and attention was called to the value of constant correction of such error of refraction in patients with a tendency to glaucoma. Mr. MacNamara

* As full reports of this section have already been published elsewhere, we give only a brief summary of the proceedings.—ED.

then referred to the connection between influenza and optic neuritis, and mentioned four cases which had been under his own care. He thought these cases were analogous to those of malarial neuritis, and might be due to the irritation of the optic nerve by micro-organisms or by the ptomaines secreted by them.

The Vision of Railway Servants.—Three papers on this subject were read by Mr. W. M. Beaumont, Mr. McHardy, and Dr. Geo. Mackay. They all dealt with the inadequacy, of the tests, and modes of conducting them, at present in vogue on nearly all the railway lines in Great Britain.

A Committee of ten, with power to add to their number, was subsequently appointed "to promote the efficient control of railway servants' eyesight in the United Kingdom."

Modified Operation for Advancement of a Rectus Tendon.—Dr. Argyll Robertson described a method of operating, which he found very satisfactory, and which is briefly as follows:—The internal rectus tendon is seized in Prince's strabismus forceps and separated from the sclera. Its opponent is then tenotomised subconjunctivally. A fine waxed black-silk thread is taken, to either extremity of which a fine curved needle is attached. One of these needles is threaded in and out through the base of the tendon, which is pulled forward by Prince's forceps. This, though it seems a weak hold, has in practice proved quite sufficient. One of the needles is now passed in and out, under and over the conjunctiva, close to the upper margin of the cornea, until a point well beyond the outer margin of the cornea is reached. In like manner, the other needle is passed under and over the conjunctiva, close to the lower margin of the cornea, till a corresponding point beyond the outer margin of the cornea is reached. A small bit of the internal rectus tendon (varying in amount according to the effect desired) is then snipped off, the ends of the ligature tightened, until the cornea is well directed inwards, and tied. The edges of the conjunctival incision are brought together by a couple of sutures. Sometimes the traction of the ligature causes the conjunctiva at some points to overlap the margin of the cornea, but this does not interfere in any way with the success of the operation. The ordinary

antiseptic washings and dressings are employed. Both eyes are bandaged for twenty-four hours, so as to keep the eyes thoroughly at rest, and the eye operated on for one day longer. On the fourth or fifth day the ligature is removed. This is easily effected by dividing the thread in any part of its course, where it lies on the surface of the conjunctiva, and pulling on the knot, when the whole extent of the ligature at once comes away.

Wound of Sclerotic with Penetration of Eyelashes into the Anterior Chamber.—Dr. Argyll Robertson described the case of a man whose eye was struck by a knife, which inflicted a wound in the sclerotic 9 mm. long, its anterior end being 3 mm. from the corneal margin. Two eyelashes lay in the anterior chamber, and the chief point of interest in the case was to determine by what route the cilia had travelled. Dr. Argyll Robertson thought they had probably entered the vitreous chamber, and subsequently passed to the anterior chamber by an aperture made by the knife at the root of the iris.

The Action and Uses of Prismatic Combinations.—Dr. Archibald Percival read this paper, which is published in full. (See p. 285.)

Iridectomy or No in Cataract Extraction.—Mr. F. R. Cross read this paper, which gave rise to an interesting discussion, in which the President and Messrs. Tosswill, Argyll Robertson, McHardy, Elliott Square, MacKinlay, and Hill Griffith took part.

Mr. Cross said that for rather more than two years he had been performing the simple extraction side by side with a modified Græfe operation. Of 61 extraction operations, he had had to do iridectomy in six cases, either to facilitate removal of the lens, or in consequence of bruising of the iris; in four prolapse of iris occurred after the operation, and required removal. There had been no case of suppuration of the cornea. The resulting vision in 43 cases was in 1, $\frac{6}{8}$; 5, $\frac{6}{9}$; 7, $\frac{0}{12}$; 6, $\frac{6}{18}$; 6, $\frac{0}{24}$; 9, $\frac{6}{36}$; 6, $\frac{6}{40}$; 1, $\frac{2}{80}$; 1, "fingers"; 1, p.l. only; in the remaining 18 no note of the vision had been kept. Mr. Cross was of opinion that healing occurs more rapidly under the simple method than when iridectomy is performed, and that the presence of the

iris in its normal position guards against incarceration of the lens capsule or hyaloid at the corneal wound—a source of danger more insidious, but not less real, than incarceration of the iris.

The Pathology of the Ophthalmoplegiæ.—Drs. W. J. Collins and L. Wilde read this paper. After reference to the complexity of the subject, owing to the possibility of small lesions producing large results, and the rarity of *post-mortem* examinations, the history of knowledge on the subject was briefly reviewed. It was pointed out that accumulating evidence made it impossible any longer to regard a group of symmetrical oculo-motor paralyses as isolable into a unique malady called ophthalmoplegia, but that these must be considered in relation to ocular monoplegia on the one hand, and bulbar paralysis, locomotor ataxy, and infantile spinal paralysis on the other. The so-called ophthalmoplegia interna could no longer be classed as a peripheral palsy, or as due to disease of the lenticular ganglion. Anatomical, physiological, and clinical facts pointed to nuclear lesion, most probably in the anterior part of the floor of the aqueduct of Sylvius. The authors suggested the following classification of ophthalmoplegiæ:—

I.—CEREBRAL : (a) Cortical.

(b) Cortico-peduncular.

(c) Nuclear.

III. { 1. Cycloplegia } “Ophthalmoplegia Interna.”
 { 2. Iridoplegia }
 { 3. Palsy of extra-ocular muscles. Ptosis.

IV. 4. Palsy of superior oblique.

VI. 5. Palsy of external rectus.

(d) Radicular (and Commissural).

II.—BASAL : (a) Region of Pons.

(b) „ „ Peduncles.

(c) „ „ Cavernous Sinus.

(d) „ „ Sphenoidal Fissure.

III.—ORBITAL (including Peripheral).

The authors had collected 141 cases of ophthalmoplegia, and classified them according to sex, age, course, history,

symptoms, seat of lesion, treatment, result, etc.; of 112 cases 73 were males, 39 females. With regard to age the decades from 20—30, 30—40, and 40—50 were the most liable. Syphilis was the cause in at least 33 per cent. When palsy of either iris or ciliary muscle co-existed with extra-ocular palsy it was more frequently the former—in 31 cases out of 34—which fact was a corollary to the accepted relation of the centres for them in the nucleus of the third nerve in accordance with Hensen and Voelcker's researches. The greater fatality of the disease, when occurring in young persons, was emphasised.

A Review of the Tests for Colour Blindness.—Dr. Edridge-Green presented this paper, in which the ordinary methods of testing by coloured lights and Holmgren's wools, etc., were criticised and their defects pointed out.

The Prognosis of Choroidal Sarcoma.—Dr. Hill Griffith gave the after-history of 23 cases of choroidal sarcoma, in which enucleation had been performed; 14 of these were well at periods varying from 3 to 10 years; 6 had died from sarcoma of liver; and 3 had died, but less certainly, from extension of disease. Local recurrence took place in 2.

The Treatment of Infantile Cataract.—A discussion on this subject was opened by the President, who said that the zonular form was more common in children than other varieties of cataract. He thought that in cases of infantile cataract of whatever nature, provided there were no special circumstances contra-indicating operation, this should be undertaken as soon as the child had finished teething.

Dr. Argyll Robertson, confining his remarks to zonular cataract, spoke of the advantage in some cases of treatment by iridectomy; he would limit this operation to cases in which the central opacity did not exceed $\frac{1}{3}$ the diameter of the lens.

Mr. McHardy thought it important to decide whether or no an operation should be performed before 12 years of age. The risk of glaucoma or secondary inflammation at this age was at a minimum. He advocated needling of the lens and its removal from 4 to 14 days later. He had almost

entirely relinquished the use of the suction tube for extraction of soft opaque lens matter.

Dr. Tosswill said that an artificial pupil should never be made if there were even a few striæ in the peripheral part of the lens ; he recommended very early operation, say at five months of age.

Mr. Lawford spoke of the pathology of lamellar cataract, and mentioned external iridotomy as a good method of making a narrow coloboma for artificial pupil.

Some Points in the Treatment of Lamellar Cataract.—This paper, by Mr. Charles Wray, was published in the last number of the REVIEW, p. 263.

The Operative Treatment of Strabismus.—Mr. Henry Juler read a paper based upon an analysis of 174 cases upon which he had operated. Of these 151 were convergent and 23 divergent squint. Of the 23 cases of divergence, at least seven cases had at some previous period been operated on for convergence. The refractive condition of the two classes of cases was approximately given. The acuteness of vision was reduced to $\frac{6}{18}$ Snellen or less in one eye in 84 cases ; it was greater than $\frac{6}{18}$ in both eyes in 34 cases, but was not recorded in 56 cases, the patients being too young. The kinds of operations performed were classified, and showed that tenotomy of the muscle was supplemented by the advancement of its antagonist in at least 48 out of 151 operations for convergence, and in at least 10 out of 23 for divergence. The author thought that more definite knowledge was required (1) as to the earliest age at which a child should be operated on ; (2) whether an adult person should be operated on at all ; (3) in what cases advancement should be combined with tenotomy of the opposing muscle. He desired to exclude all cases of mere occasional or periodic squint, as well as all cases of mere insufficiency of the interni, from the discussion.

Notes on a Rare Tumour of the Iris removed by Operation.—This paper, by Dr. Charnley, will be published in full in a future number of the REVIEW.

The Ophthalmoscopic Appearances in Hypermetropic Eyes and their Significance.—Dr. H. C. Bristowe read this paper, which will shortly appear in the REVIEW.

The Use of Fluorescin in the Diagnosis and Treatment of Diseases of the Cornea.—Dr. Bronner, who read this paper, had found that fluorescin gave valuable assistance in cases of corneal ulceration or abrasion. He used a solution of 2 % fluorescin and $3\frac{1}{2}$ % carbonate of soda, and found that this mapped out accurately the extent and depth of ulcers of the cornea.

The Eyesight of School Children.—Dr. George Ferdinands presented a paper giving the results of his investigations among a total of 3,002 children attending the Aberdeenshire Board Schools. The percentage of myopia was 13.4, and of hypermetropia 16.5. The results, with tables and charts, are published in full in the *British Medical Journal* of September 12th.

THE OPHTHALMOSCOPIC APPEARANCES IN HYPERMETROPIA AND THEIR SIGNIFICANCE.*

BY HUBERT C. BRISTOWE, M.D., LOND.

Although it has long been recognised that in hypermetropic eyes certain unusual conditions are often present, but little importance has been attached to them, and their significance and causation have been but little worked out.

There are two conditions generally described, viz., the hypermetropic disc and that in which the retina is visible as a bright reflecting surface. The hypermetropic disc, or pseudo-neuritis, is a condition in which the optic disc is hazy, the haziness varying from a slight amount on the nasal side to a general blurring, with some swelling at the edges, over which the vessels take a tortuous course. The vascular sheaths also are thickened in this neighbourhood. The condition is one which closely resembles, and may be mistaken for, optic neuritis, and that it is not true optic neuritis is often only proved by the fact that it does not alter under observation and that cerebral symptoms are entirely wanting.

The other condition is one in which the retina is seen as a bright surface, not unlike mother-of-pearl, or, as I have been accustomed to hear it named by Mr.

* Read at the Annual Meeting of the British Medical Association, held at Bournemouth, July, 1891.

Nettleship, "watered silk." This sheen seems to be confined to no special part of the retina, but is as a rule general, though usually best marked in the yellow-spot region. One variety of this latter condition is characterised by the presence of bright lines radiating from the yellow spot, suggesting a resemblance to the petals of a sunflower. But there is still another appearance which I have never yet seen described, to which I wish to call your attention. In a small number of cases, on the yellow-spot side of the disc, the retina shows striæ, which run concentrically with the outline of the disc, and may extend as far as the fovea, the lines becoming segments of larger circles, till finally near the macula they appear almost straight. These striæ are very fine, and are most distinctly seen on moving the ophthalmoscope slightly from side to side. In one very intense case I was able to make out clearly that the retinal vessels were not implicated in the striation, but followed a straight course apparently below the striated layer. For the condition above described I propose the name "concentric retinal striation."

In order to study the condition of the fundus in cases of hypermetropia, I have, through the kindness of Messrs. Nettleship and Lawford, collected 125 cases among persons of all ages and with all degrees of error, and have carefully excluded those in which any pathological condition existed.

From these statistics I have arrived at the following conclusions, which I shall first place before you, and shall then proceed to discuss the cases, and show the grounds on which my deductions are based.

The hypermetropic disc is found at all ages, and probably continues throughout life. It in no ways interferes with the acuteness of vision nor damages the usefulness of the eye, nor has it any definite relation to the degree of hypermetropia. An intense pseudo-neuritis may be present with a very low degree of error.

The "watered silk" retina I have only observed in

early life, generally under 15 years; once only have I found it in a patient above that age, namely, in a boy of 17, but he was badly developed and undersized. I believe that this condition belongs to infancy, and disappears with the advent of puberty. As in the former case, the intensity of the condition bears no relation to the degree of hypermetropia, and in no way affects the acuteness of vision.

The "concentric striation" appears under exactly the same conditions as does the "watered silk" retina, and, like it, has no relation either to the acuteness of vision or to the degree of error. I have found it only in children.

In 71 cases, or 56·8 per cent., the fundus was absolutely normal. The ages of these patients varied from 3 to 76, and the hypermetropia from ·5 D. to 12 D. The corrected vision in patients with + 4 D. and under was $\frac{6}{8}$ in 20 cases, $\frac{6}{9}$ in 9 cases, and $\frac{6}{12}$ and $\frac{6}{18}$ in 2 cases each. In one case in which only $\frac{6}{36}$ was reached there was + 7 D. of error, and one which could not be improved beyond $\frac{6}{24}$ had + 9 D.

The hypermetropic disc was present in 29 cases, or 23·2 per cent. The ages of the persons in whom it was present varied from 35 to 6, and some of the best marked cases occurred in persons over 30. The degree of hypermetropia varied within large limits; thus in one case of only + 5 D. the optic disc was hazy, especially to the nasal side, the vessels were very tortuous, and the veins turgid, but there was no distinct swelling; whilst in another of + 8 D. the pseudo-neuritis was scarcely marked, and in still another of + 10 D. it was intense. The corrected vision obtained was quite as good as in the cases of simple hypermetropia. With an error of + 4 D. and less, 8 reached $\frac{6}{8}$ and 2 $\frac{6}{9}$; with greater error, one, with + 10 D. did not improve beyond $\frac{6}{24}$ and one, with + 7 D. not beyond $\frac{6}{36}$ but in this last case the yellow spots were unusually bright.

Simple "watered silk" retina was present in 16

cases, or 12·8 per cent. The ages of the patients varied from 3 to 17. No trace of this condition was observed in any adult patient. The hypermetropia present in these cases was + 3 D. or less in 7 cases, and in one it was only + 0.75 D. while at the other end of the scale one had + 10 D., and another + 12 D. of error. In these cases, as in the cases of pseudo-neuritis, the corrected vision was quite up to the normal standard. Of those with an error of + 4 D. and under, six reached $\frac{6}{6}$, one $\frac{6}{9}$, and one could not be improved beyond $\frac{6}{36}$, although there was nothing to account for the deficiency, except perhaps the age, and general want of intelligence. I detected the typical sunflower appearance in only 3 cases, though in several others the "watered silk" condition nearly amounted to it. The ages of the patients were 9, 12 and 15, and the error varied from + 1.5 D. to + 6 D., with 3 D. of astigmatism, yet in all the vision obtained was good, the astigmatic case alone not improving beyond $\frac{6}{9}$.

The concentric striation was present in nine cases. It was observed only in children between the ages of 3 and 15, and in no single instance have I found any trace of it in adult life. The degree of hypermetropia present varied from + 1.5 D. to 12 D. The most marked example occurred in a boy of 14 with an error of only + 1.5 D., whereas in the case of greatest error the striation was but slight. The corrected vision was, to say the least, up to the normal average, for just over 50 per cent. obtained $\frac{6}{6}$, one with + 7 D. reached $\frac{6}{9}$, and another with + 7 D. $\frac{6}{12}$, while in two cases the children were too young to know their letters.

What is the pathology of these conditions?

That the hypermetropic eye is an imperfectly developed eye is probable; at any rate this view is maintained by Landolt, Donders, and Schaefer. The last even goes so far as to say that it is often part of a general want of development, and describes a hypermetropic face in type like the Mongolian.

In favour of this view is the fact that hypermetropic eyes sometimes becomes less hypermetropic, whilst myopic eyes never become less myopic.

The hypermetropic disc has been explained in several ways. Landolt states that it is due to imperfections of the nervous apparatus; and the tortuosity of the vessels he accounts for in the following manner:—“The retinal vessels are developed in a cavity previously formed, that of the ocular globe. The latter being remarkably small in high degrees of hyperopia, the vessels are prevented from extending to their full length, and therefore become twisted.”

But when we consider that the vision of these patients is up to the normal standard, we can hardly believe that the nervous apparatus is imperfect, nor can the actual amount of nerve matter be less than normal, if the retina which contains the vessels is so large as to become crinkled. Loring explains this condition by saying that “the connective tissue elements are so abundant that they produce, in the neighbourhood of the disc, a lack of perfect transparency in the retina, which then shows itself, when taken as a whole, in the form of minute striæ that radiate as a usual thing from some part or whole of the disc as a centre.” He goes further, and applies the same explanation to the “watered silk” retina, thus: “In some hypermetropic eyes this appearance is so marked, and the reflection from the connective tissue elements so brilliant, as to show a silvery or metallic lustre, which then seems to stream out from the papilla in fine radiating lines.”

Landolt mentions the “watered silk” retina, but offers no explanation.

When we remember that in pseudo-neuritis there is often excess of connective tissue on the disc and in the region of the vessels near the disc which can be seen with the ophthalmoscope, Loring’s explanation seems a reasonable one. But if the same explanation is correct for the “watered silk” retina and its varieties, how is

it that the superabundant connective tissue is absorbed at an early age, or disappears from view in the case of the watered silk retina, whilst in the hypermetropic disc it remains throughout life?

Another interpretation of this "watered silk" appearance must then be necessary.

The physical one is easy. That the mother-of-pearl appearance is produced by an innumerable number of minute striæ is well known, and although the individual striæ are invisible the result is a brilliant sheen. This condition is actually present in the eyes of many animals, and gives rise to a bright, reflecting surface, known as the tapetum lucidum. In the herbivora it is caused by connective tissue fibres, while in the carnivora it is due to a special cell layer. I am not, however, inclined to think that the "watered silk" retina is a remnant of this, for in the first place the sheen is superficial to the retinal vessels, while the tapetum lucidum lies between the capillaries of the choroid and the stroma of the pigment layer; and, again, this condition disappears at an early age.

Schultz has shown that the cells of the ganglionic layer of the retina have, while alive, a minute parallel striation which is continued into the cell processes, a condition which is also present in the ganglion cells of the cord and brain; and he further points out that when the cell protoplasm becomes granular, the striation is no longer visible.

In the development of the eye, the ultimate object, so far as the media are concerned, is the perfect transmission of light. For that purpose the cornea, lens, and vitreous lose their foetal characters and become transparent. In the same way it is necessary that those layers of the retina which are placed between the end-organs and the vitreous should allow a free passage to light. This striated condition of the ganglion cells must necessarily cause some irregular refraction, although it may be but little. A higher state of development would

then reduce this to a minimum. In the cases in which the highest development has taken place, the striation would be but slight, and the results barely observable. But in those cases in which the highest perfection has not yet been obtained, some results might be expected—results to vision so small that they may be neglected. It seems to me that the striation, if well marked, would easily account for a lustrous appearance ; or, in other words, for the “watered silk” retina. This condition would then disappear on more complete development.

Again, if the striæ should be well marked, but less numerous and further apart, we should then lose the brilliant sheen, and obtain only a striated appearance, such as is seen in the concentric striation. I would suggest this as the probable explanation of these phenomena.

From my statements it would appear that there are two forms of hypermetropia:—one where the eyeball is fully formed, but has an abnormally small antero-posterior diameter ; and another in which the hypermetropia is due to the immature development of the globe and its contents.

SUGGESTED TECHNIQUE TO PREVENT STRAIN ON THE SUPRA AND INFRA- CORNEAL SUTURES DURING THE RE- ATTACHMENT OF ADVANCED MUSCLES.

BY CHARLES WRAY, F.R.C.S.

The rectus is exposed in the usual way, and carefully dissected up so as to secure the full advantage of tendinous structure, not only in the advancement of the muscle, but also in the anchorage of the globe.

Assuming the central part of the tendon is 3·5 mm. and the lateral 5 mm. long, it is clearly of the greatest importance to be quite certain that its actual, and not its apparent, insertion has been reached.



Fig. I.

The muscle having been exposed with as little violence to the parts as possible, the cat-gut suture *a a'* is passed from below, as in Fig. I, and a second of black silk, *b' b*, through its loop. The former is then drawn up, tied tightly, and the ends cut off (*a' a* Fig. II.), the loop

enclosing the central portion of the tendon and the thread *b' b*. Afterwards the supra and infra-corneal sutures *c' c* and *d' d* are passed ready for tying and the

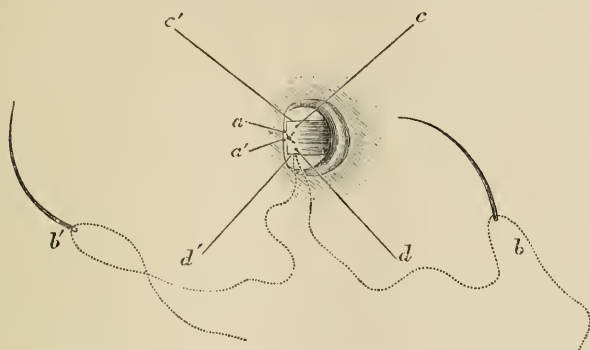


Fig. 2.

tendon detached, as in Fig. III. Prince's forceps are unnecessary, and, as they infallibly bruise the structure they grip, may be assumed to act antagonistically to primary union. The needles of *b b'* are passed as far

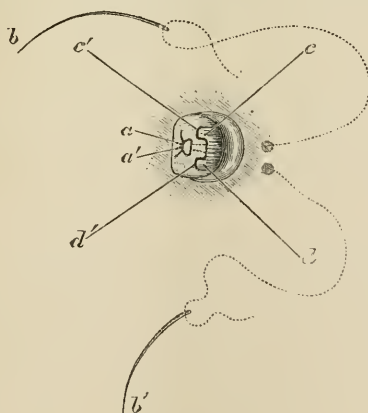


Fig. 3.

back as possible through the muscle, check ligament and conjunctiva, and brought out as in Fig. III. The advancement is then completed by tying *c c'* and *d d'*,

and when this part of the operation has been satisfactorily accomplished a shot is run on $b'b$ (the globe being rotated towards the side of operation) the ends

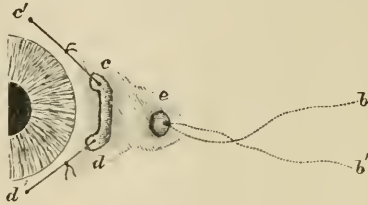


Fig. 4.

of which are drawn upon and the shot thrust down on the tissues and clamped when the degree of rotation indicates there can be no tension on $c c'$ and $d d'$.

TH. LEBER (Heidelberg). On the Origin of Inflammation, and the Operation of the Agents which cause it. *Leipzig, Englemann, 1891.*

(Continued from page 309.)

Part II. describes a series of similar experiments with fission fungi (Schizomycetes—Spaltpilze). The results were essentially the same as those obtained with the mould-fungi.

Working in conjunction with G. Stromeyer, Leber ascertained that simple uninfected wounds of the cornea have very different consequences from those into which a septic material is introduced. Even simple wounds, in which chemically inert foreign bodies are retained, cause no noteworthy inflammation, and fragments of oxidisable metal cause only a slight local reaction, whereas inoculation with certain septic substances causes a suppurative inflammation closely resembling the hypopyon keratitis which occurs in the human eye, and which is distinguished from the slighter reaction above-mentioned by its intensity and

its tendency to affect other parts of the eye. These characters are clearly attributable to the presence and growth of septic organisms.

For example, when the cornea of a rabbit is inoculated with a minute quantity of the *leptothrix buccalis*, which on the mucous membrane of the human mouth appears to be a harmless parasite, an intense suppurative keratitis constantly follows. Inoculations with putrefaction-bacilli give less constant results, and on this account a series of experiments was made with bacilli prepared by artificial cultivation and free from the chemical products of the putrefactive process. The effects were regular and typical. When a sufficient quantity was introduced into the cornea there followed suppurative keratitis, leading on in severe cases to hypopyon and pupillary exudation, and having around the inoculated area the filtration ring described in the previous section. When a smaller quantity was introduced there followed only a slighter purulent infiltration around the wound, with slight marginal opacity of the cornea and injection of the conjunctiva, and these inflammatory changes soon subsided. The inference is that artificially-reared putrefaction-bacilli find an unsuitable soil in the cornea, and multiply in it to a very small extent, or not at all. There is no evidence that the bacilli make their way into the anterior chamber, and are there the immediate cause of the hypopyon; indeed, they are usually not to be found in the pus removed from the anterior chamber, and this is true also of the pus of hypopyon in the human eye.

It appears, then, that putrefaction-bacilli introduced into the cornea produce their evil effects by diffusing a soluble toxic substance in the surrounding tissue, with secondary consequences resembling those described in the case of the mould-fungi.

Part III. deals with certain experiments which were undertaken to test the truth of the inference already mentioned; in other words, to test the action of certain extracts and substances obtainable from the micro-organisms. So early as the year 1879 Leber began some experiments of this kind, both with mould-fungi and with putrefactive

products. He found that injections of such material were capable of producing suppurative inflammation, although the micro-organisms themselves had been previously killed by boiling or by treatment with alcohol. The inflammatory process thus produced was found to be more or less transient, doubtless because the irritating substance was quickly carried away from the eye, and there were no living organisms to continue the supply. It appears that Pasteur had observed the same phenomena at an even earlier date, but had not been led to attribute the irritative action of dead microbes to a poisonous substance derived from them; he had regarded it rather as a property common to all solid matter thus employed. A more precise investigation of the subject became possible a few years later through Rosenbach's observations on the growth and cultivation of the staphylococcus aureus, an intense exciter of inflammation, and one which, by reason of its colour and other characters, lends itself well to accurate experiment. After ascertaining that this organism, though sterilised by boiling, causes violent inflammation when injected into the anterior chambers, Leber set himself to extract its active principle. He found that, by means of diffusion through a membrane or filtration through paper, he could obtain fluids absolutely free from organisms, which still possess the power of exciting inflammation and necrosis. He found, further, that both from a watery and an alcoholic extract of the cocci, he could obtain a substance possessing this power in very high degree. To this substance he gave the name *phlogosin*.

The several sub-sections of this portion of the work describe in detail the various experiments made and the results obtained with extracts of various kinds, and especially with that obtained from the staphylococcus aureus. Further, the chemical reactions of these fluid extracts and the substances obtained from them is here described. For these details, and also for the very numerous references to the work of other experimenters, the reader is referred to the original.

P. S.

L. DARKSCHEWITSCH (Moscow). The Decussation of the Optic Nerves. *V. Graefe's Archiv.*, XXXVII. 1, p. 1.

This article deals with the oft-disputed question of the complete or partial decussation of the optic nerves in mammalia, and is in great part a criticism and refutation of the work published upon this subject by Michel in 1887. Darkschewitsch commences by a detailed description of the fibres seen in the region of the tuber cinereum under the third ventricle. The first system of fibres is that described by Forel, which lies over Mequert's commissure, and is named by our author, after its discovery, "Forel's decussation of the fibres of the tuber cinereum." It can be demonstrated in the brains of men and cats. Under it lies the second system, Mequert's commissure, which acquires its medullary sheath much earlier than the optic tract or than Forel's fibres. From this circumstance we may certainly conclude that Mequert's commissure has nothing to do with either the optic nerves or Forel's fibres. It is better developed in the cat than in man. Besides these two structures there is also in this region Gudden's commissure, or the lower cerebral commissure. Its fibres are so closely connected with those of the optic tract that to isolate them properly it is necessary to produce atrophy of both tracts—*e.g.*, by enucleating the two eyes of a newly-born animal.

Darkschewitsch holds that Michel's conclusions are vitiated by his confusing Forel's fibres with Mequert's, and Mequert's again with Gudden's, and a detailed criticism of Michel's observations and illustrations is given in support of this view.

From experiments upon the cat Michel has concluded that the development of the medullary sheaths of the fibres of the optic nerves proceeds from the globes centripetally towards the chiasma, that of the fibres of the tracts from the brain centrifugally toward the chiasma. The experiments consisted in enucleating one eyeball in young kittens, and finding the opposite tract many days

afterwards microscopically normal or nearly so. Darkschewitsch has repeated these experiments with totally different results. The tract of the opposite side has always been found markedly atrophic; Mequert's and Forel's fibres, on the contrary, are normal. The atrophy of the tract is still more marked if rabbits are employed instead of cats. The fibres of the opposite tract are not all destroyed by these experiments, and it is not possible to decide without other tests whence the remaining fibres come. Some, no doubt, are Gudden's fibres. But our author finds that enucleation of one eye in a new-born kitten produces not alone atrophy of the opposite tract, but also, to a less extent, atrophy of the tract on the same side, and we may hence conclude with great probability that the decussation of the optic nerves in the cat is only partial.

Division of the optic tract itself affords a better proof of the point at issue, as we can then be certain that all the fibres from one cerebral hemisphere, whether crossed or uncrossed, are destroyed. This has been done by Gudden, whose experiments Darkschewitsch has repeated, and modified with the following results.

Division of the optic tract in the kitten produces, besides complete atrophy of the tract itself, partial atrophy of both optic nerves, the nerve of the opposite side being most atrophied, but both nerves contain normal nerve fibres. The tract of the opposite side exhibits also some atrophy (from the presence in it of Gudden's commissure). Forel's fibres and Mequert's commissure are not affected.

Michel has not taken account of these experiments of Gudden's, and his own experiments of dividing the chiasma in the middle line are inconclusive, because they were performed on adult animals.

Darkschewitsch concludes that none of Michel's observations are calculated to in any way weaken Gudden's theory of a partial decussation of the optic nerves in the higher mammalia.

J. B. S.

D. C. LLOYD-OWEN (Birmingham). *The Elements of Ophthalmic Therapeutics.* *Cornish Brothers, Birmingham, 1890.*

The late Mr. Richard Middlemore, whose connection with ophthalmology began so long ago as 1828, and who was for very many years the leading specialist in Birmingham, established and endowed a few years ago a post-graduate lectureship in connection with the Birmingham and Midland Eye Hospital. The small volume before us contains the first course of lectures delivered under this endowment by the present senior surgeon of the hospital. The purpose of the lectures, in accordance with the intention of the founder, was to digest and arrange for the service of those who are engaged in the absorbing duties of general practice the results of the researches and experience of those who devote themselves particularly to ophthalmology, and this purpose is here fulfilled in a very useful and practical manner.

After paying a tribute to the many services rendered to ophthalmology by the founder of the lectures, the author discusses in the first two chapters the various therapeutic agents employed in the local treatment of diseases of the eye—mydriatics and myotics; astringents, stimulants, and irritants; caustics; antiseptics; heat and cold; blood-letting and counter-irritation. In the third chapter, the particular uses of various internal remedies are described—opium, aconite, chloral, bromides, gelseminum, croton chloral, quinine, mercury, iodide of potassium, salicylate of sodium, iron, arsenic, strychnia. The work is based on a large practical experience, and contains many useful therapeutic hints not always to be found in larger treatises.

PRIESTLEY SMITH (Birmingham). *On the Pathology and Treatment of Glaucoma.* *London, J. and A. Churchill.*

It would be out of place here to critically examine a work written by one of the editors of this REVIEW, but we may quote the following portion of the preface in order to show the character and scope of the book before us:—

"This volume is a revised publication, with additions, of three lectures which were delivered at the Royal College of Surgeons, under the Erasmus Wilson bequest, in March, 1889, and printed in the *British Medical Journal* shortly afterwards.

During the two years which have elapsed since that time, several parts of the subjects have been more fully worked out. The causes of glaucomatous complications after operations for cataract have been more clearly defined, mainly through the labours of Mr. Treacher Collins; the connection between primary glaucoma and certain dimensional variations in the eye have been more positively established; the condition of the vortex veins in glaucomatous eyes has been further investigated; and some additional varieties of glaucoma have been examined.

An account of these matters is here given; a short section describing the secondary changes produced by high pressure is added, and the treatment of glaucoma is dealt with more fully than before. The subject-matter, although considerably increased in amount, is still presented in the original form of three lectures.

In an appendix at the end of the volume are placed certain tables of measurements and statistics which may be useful for reference, together with an account of the methods which were employed in preparing and examining specimens."

SIGMUND FUCHS (Vienna). On Papilloma of the Conjunctiva. *Archives of Ophthal.* XX. 4.

The writer has had the opportunity of observing and examining microscopically eleven cases of conjunctival papilloma; two of these were under observation for a considerable time, the others were removed without delay. Preferring to call them papillary fibromata, according to Virchow, the author recalls the fact that they are really fibrous growths, although in many cases the connective tissue element has become so much atrophied, and the

epithelial so much increased, that their true nature is apt to be forgotten. Seeing that papilloma may develop in any part of the conjunctiva, and that papillæ are not present in all parts of this structure, these little tumours must not in every case be regarded as merely undue hypertrophy of normal papillæ. He distinguishes the method of growth of those springing from the tarsal conjunctiva from those which are connected with the conjunctiva of the globe; the former, as a rule, having a wider base and a more "cauliflower" appearance, while the latter are generally polypoid in shape. Papillomata of the sclero-corneal border at an early stage can be with difficulty, if at all, distinguished from epithelioma; but when the growth has spread beyond the corneal edge the difference becomes apparent, inasmuch as epithelioma infiltrates or adheres to the corneal tissue, while a papilloma leaves it intact.

Histologically all the cases were of the same nature; notes of the first two are given in detail, but as they present nothing unusual it is unnecessary to quote them: both tumours were removed with the subjacent conjunctiva, and the wounds healed by first intention. Microscopically it was found that the epithelial structure was highly developed in comparison with the amount of connective tissue stroma. This latter, most marked in Case 1, was of the ordinary fibrous type, as seen in the connective tissue portion of the conjunctiva, and showed in different parts a mesh-like arrangement, in the interstices of which were numerous lymph corpuscles. In the separate papillary processes the connective tissue was arranged in more or less parallel striæ, which were compressed in the pedicle, and in the true papilla spread out in an irregular network. In small detached pieces of the growth the connective tissue was made of delicate fibres richly supplied with blood-vessels, so that it appeared in places as an adventitial sheath of the vessels. In its deeper layers the epithelium was mostly cylindrical, gradually becoming pavement-shaped as it neared the surface.

With reference to division of the nucleus, the author found a number of examples of Arnold's type of division by direct fragmentation.

The latter part of the paper is devoted to a careful description of a case of papilloma of the palpebral conjunctiva with papillomatous formation over the whole surface of the skin. Fuchs has found only one analogous case in the literature, that reported by Lang of Innsbruck. J. D., *æt.* 59, suffered in 1878 from a skin eruption, with swelling and warty protuberances of the lids, and much photophobia and lachrymation. In 1880 parts of the skin were covered with warty growths, some pointed, some bulbous. On the eyelids and the surrounding skin were many small pigmented papillomata, projecting 2—3 mm. from the surface; the lids were thickened and unduly red; the conjunctiva also was covered with small warts, which were larger toward the lid margin. The patient died early in 1881, the *post-mortem* showing gastric carcinoma, shrunken kidney, and endarteritis. Sagittal sections of the upper lid were cut and stained, and preparations made from pieces of skin removed for the purpose. The skin and mucous membrane of the lids were found to be covered with tufted, finely papillary warts, the connective tissue stroma of those springing from the conjunctiva closely resembling that of the broad papillæ found in the conjunctivæ of persons subject to chronic catarrh. The epithelium was squamous in its upper layers, with an underlying stratum of cylindrical cells. At the free margin of the lid the papillomata became epidermoid in character, each showing two distinct layers, a superficial corresponding to the epidermis, and a deep corresponding to the corium. The superficial epidermoid layer again divided into two, the first formed of flat cells without nuclei and taking the stain only faintly, the second, which in its turn was more or less definitely separable into two portions, showing at its deeper part a single layer of cylindrical cells lying on the sclera, while nearer the surface it consisted of polygonal cells. The mesoblastic portion of the individual elevations was made up of many little cones—the papillæ corii. These were highly vascular and rich in nerves, and passed into a tissue corresponding exactly in structure to the connective tissue basis of the normal skin of the lids. In some of the papillæ there was new hair formation.

The author does not feel clear about the ætiology of this case. No specific micro-organisms were detected, and death occurred too soon after the patient's admission to the clinic to permit of the study of therapeutic remedies.

N. M. M.L.

WAGENMANN (Heidelberg). The Anatomy of Membranous Secondary Cataract with Remarks on the Healing of Wounds of Descemet's Membrane. *V. Graefe's Archiv.* XXXVII. 2.

Reference is made at the outset to a paper published by the author some time ago* on hyaline new growth occurring on the posterior lenticular capsule of a cataractous eye from which the lens had been removed. In that case, owing chiefly to the presence of a purulent infiltration of the tissues, it was difficult to be sure of the exact origin of the new formations. More especially was it impossible to determine the relation of the lens epithelium to the posterior capsule. Wagenmann, however, hazarded the opinion that the new growth, constituting a secondary cataract, was most probably due to the extensive proliferation of the lenticular epithelium.

In the case which forms the subject of the present paper, the secondary cataract developed without any inflammatory symptoms, and in an eye in which the recovery after extraction had been "almost ideal."

The clinical history is as follows :—J. R., æt 57, presented himself on December 12th, 1887, with mature cataract of the right, and incipient cataract of the left eye. There were no complications beyond a slight catarrhal conjunctivitis. The right lens was extracted on the following day. The method adopted was the modified linear operation of v. Graefe, with removal of a piece of the anterior lens capsule. The wound healed normally: a fortnight

* *V. Graefe's Archiv.* XXXV. 1.

later V. = $\frac{20}{50}$ with + 12 D., and J. 2 with + 18. In July, 1888, the vision of this eye was practically as before. Two and a quarter years after the operation the patient returned, saying that the sight of his right eye had been failing for some time. V. = fingers at 5 m. with + 12 D., and J. 15 with his reading glasses. Focal illumination revealed a delicate secondary membrane, clearly visible through the coloboma of the iris. The patient was taken into hospital, and the left cataract, now mature, extracted. The case did well, but before needling could be performed in the right, he succumbed to an attack of acute pneumonia. The right globe was excised four hours after death, and hardened in Müller's fluid. Sections were cut in series.

Microscopic Examination.—Towards the temporal side and lying behind the iris some remains of the anterior capsule much folded on itself are to be seen; in this situation also a small portion of old lens matter intermixed with new-formed products of lens epithelium lies in a pouch formed by anterior and posterior capsule; elsewhere only the posterior capsule is left. The epithelial layer is especially well marked on the front of what remains of the anterior capsule; it can also be seen in patches on the anterior surface of the zonula, and here and there on the posterior surface of the posterior capsule. Anterior to the posterior capsule, and separated from it only by a thin line of demarcation, there are distinct hyaline layers evidently of new growth; the posterior capsule itself is thickened. The seat of the wound of Descemet's membrane was carefully examined. The two sides of the cut membrane are separated by a very delicate film of tissue, which extends a little outwards from the cicatrix. Deep to this there is a stratum of newly-formed glassy-like substance which on its inner surface is covered with endothelium. The author has no doubt that this material is derived from the endothelium.

N. M. M.L.

AMERICAN OPHTHALMOLOGICAL SOCIETY.

TWENTY-SEVENTH ANNUAL MEETING,
HELD AT WASHINGTON, SEPTEMBER, 1891.

President : DR. HASKET DERBY, of Boston.

Cataract Extraction.—Dr. D. Webster, of New York, reported 136 cases, of which 20 were modified Graefe extractions, and 116 by the so-called simple method. His results were, among the extractions with iridectomy, 75 per cent. successes, and the remainder partial successes or failures; and among the "simple" extractions there were 91 per cent. of successes, 5 per cent. of partial successes, and 3 per cent. of failures. Among the former a majority had vision of little better than 1-10th, while of the latter a large proportion had vision of 20-20ths, or even of 20-15ths. His experience indicated the vast superiority of the "simple extraction."

Prolapse of the Iris in the Extraction of Cataract.—Dr. H. Knapp, of New York, in a paper on the occurrence, prevention, and management of this accident, said that since June, 1886, he had done 564 extractions, 55 with iridectomy, 509 without. Of the latter, 42 had prolapse of the iris in various degrees. The smaller prolapses were in the majority, and either disappeared or remained small and did no harm. To prevent prolapse he would: (1) Make an iridectomy when in the particular case, all points considered, the combined operation offers the better chance for the restoration of sight. (2) Cocainize thoroughly, except in old, emaciated people, keeping the eye closed during the cocainization. (3) Make the classical incision, beginning near the horizontal meridian, continuing in the same plane near, but never encroaching upon, the limbus. (4) Open the capsule by one long horizontal incision in the upper part beneath the iris. (5) Cleanse the pupil and anterior chamber carefully. (6) Avoid prolapse of the vitreous and every rupture of the zonula-capsular septum. (7) Carefully reduce the iris. (8) During the first day or two keep the patient as quiet as general health and reasonable comfort

permit. (9) Watch the patient, or tie his hands during sleep, during the first week. The majority of prolapses are traumatic. For treatment of the prolapse, it is advised to leave it alone for ten days. It may be cut on the second day, but the results of cutting from the third to the tenth day have been unfavourable. The failures of simple extraction have been very rare ; prolapse of the iris is the dark side of this excellent operation. It is hoped that by further study their number may be reduced to a minimum.

The Syringing out of Cortical Matter in Cataract Extraction.—Dr. J. A. Lippincott, of Pittsburgh, had resorted to this method in one hundred cases. In every case a preliminary iridectomy was done, usually quite a small one. The capsule was freely lacerated at the centre, and the cortex removed by syringing, without any resort to manipulation of the cornea. In two cases there had been exposure of the vitreous, and in eight there was some escape, and among these latter cases had occurred the two failures of the series. There were six cases of slow healing. In one case ether was given on account of the behaviour of the patient at the preliminary iridectomy. A third case that should be counted among the failures was one in which suppurative panthalmitis occurred after the preliminary iridectomy.

Dr. E. Gruening thought that the iris does not prolapse in the modern operation as it did in the former years of flap extraction because of the reduction of tension by cocaine. It is a nice point to get just the proper influence of cocaine in this direction ; if too much effect is produced it becomes difficult or impossible to expel the lens. He used about three instillations of the four per cent. solution within six minutes of the time of beginning the operation.

Dr. Chas. S. Bull makes the incision described by Dr. Knapp, and uses eserine in the strength of one-tenth to one-fourth of a grain to the fluid ounce of water in the after-treatment. It is of the greatest importance to operate on the patient in the bed in which he is subsequently to lie, and to keep him as quiet as possible after the operation. But if prolapse does occur, an early and complete excision should be resorted to.

Dr. H. D. Noyes, of New York, would have it remembered that prolapse or incarceration of the iris used to occur after even large iridectomies, only then it was always located at the angles of the wound instead of at its centre ; and that, occurring so, it was the same unpleasant and dangerous complication. He believed its occurrence was largely due to a condition of simple increase of tension in the eye-ball at the time of operation, to uncontrollable squeezing of the lids, and to traumatism, which might cause a reopening of the wound even as late as the ninth day.

Coloboma of the Iris, Polycoria and Primary Glaucoma.

—Dr. Geo. E. de Schweinitz, of Philadelphia, reported a case in which these co-existed. The defects of the iris were congenital, and the glaucoma occurred when the patient, a woman, was 52 years of age. The eye also exhibited several areas of exudative retino-choroiditis. The glaucoma ran a subacute course with exacerbations, in one of which iridectomy was done, and gave relief. The coloboma was downward and slightly inward, and there were three apertures in the upper and inner portion of the iris, one of which was crossed by two fibres of persisting pupillary membrane ; while upon the capsule of the lens there was a small tag of brownish colour which the author attributed to the remains of capsulo-pupillary membrane. The observations of Collins (see p. 101 of this volume) on the pathology of allied cases were referred to. The case was also held to substantiate the view that the so-called supernumerary pupils are simply defects in the iris tissue arising from an incomplete evolution of the choroid, and do not represent malformations due to a true arrest of development. The paper was illustrated by charts of the field of vision, and coloured drawings of the iris and fundus.

Partially Bony Growth of the Orbit, Removal, Recovery.

—Dr. B. L. Millikin, of Cleveland, reported a case of this kind occurring in a girl who had noticed a small hard tumour in the upper inner portion of the orbit at the age of six years. At nine years of age an operation was done for its removal, which left a wound that continued to discharge for five months, but the tumour continued to grow, until at 16 it involved the whole inner and upper

portion of the orbit, extending outward to the outer third, and about an inch below the line of the eyebrow, causing marked exophthalmos downwards, outwards, and forwards, and partial atrophy of the optic nerve, with thread-like arteries, and vision reduced to 6-30ths. It was completely removed with bone forceps, chisel, etc., and proved to have a bony wall with a soft, fibrous, organised interior. A drainage tube was inserted, and dressing of bichloride gauze applied. On the thirteenth day the wound was entirely healed, and the patient left the hospital in good condition. There has been no return in a year and a half. The microscope showed it to be a small spindle-celled sarcoma, with numerous points of fatty degeneration simulating small cyst cavities.

Operative Treatment of Detachment of the Retina by Schorler's Method.—Dr. C. S. Bull, of New York, briefly reviewed the operation and the views on which it was based (see *O. R.*, 1890, p. 173), and reported five cases of his own, treated in this way. His conclusions were distinctly against the use of the method. None of his cases were permanently benefited. In two cases the reaction excited amounted to panophthalmitis with entire loss of vision in one, and its great impairment in the other. In the most favourable cases the ultimate effect was rather to change the location of the detachment than to lessen or remove it. And in each case that could be watched with the ophthalmoscope there was caused a tract of partial opacity and cicatrization in the vitreous that must tend to drag upon the opposite portion of the retina by its cicatricial contraction, and thus render a partial detachment total.

Dr. T. Y. Sutphen, of Newark, reminded the Society of a case he had reported to it three years ago, in which very extensive detachment was cured by repeated puncture, and stated that the improvement continued to the present time, vision being 20-30th.

Macular Changes, or Detachment of the Retina in Advancing Myopia.—Dr. Hasket Derby, of Boston, had found that the macular changes, pigmentation and circum-jacent hæmorrhage in sclerotico-choroiditis posterior rarely or never coincide with, or are followed by, retinal separation.

That the appearance of the former condition involves the probability that the latter will never take place, and affects our prognosis, enabling us to predict the retention of a certain amount of vision for the remaining years of life. The members present were asked for any experience contradicting this view, but none was reported.

Brain Tumour with Autopsy.—Dr. Bull reported a case in which the patient, a middle-aged man, had consulted him for persistent inequality of the pupils. He had a history of syphilis, and now had seizures of what appeared to be petit mal, lapses of memory, ptosis and paresis of the internal recti, but no headache. His vision was: right, 20-30ths; and left, 20-20ths. The right eye showed a moderate optic neuritis, the left only the ordinary fundus changes of myopia. He was given potassium iodide one-half ounce in the day, and the neuritis subsided, and did not reappear. The cerebral symptoms increased, however, and hemianæsthesia developed. He had no headache until a few hours before death. At the autopsy there was found an entire absence of meningitis, but a large glioma in the left frontal lobe.

Brain Tumour ; Autopsy.—Dr. L. H. Taylor, of Wilkesbarre, reported a case occurring in a healthy young man, who, after some headache, fell while playing tennis, had to be helped up, and from that time was confined to the house. At first the headache was very severe and persistent, there was some staggering, vision was 20-30ths in each eye, there was esophoria, and a very high sense of choked disc. After falling there had been exophthalmos, which had disappeared. Later, there was optic atrophy, numbness of the face and tremors, but no convulsion, with the possible exception of his first seizure, and no mental derangement. The autopsy showed the skull eroded in the posterior parietal region, the dura mater pushed up into the opening, and beneath the posterior cerebral lobe, springing from the corpora quadrigemina and floor of the fourth ventricle, a glioma two and three-quarters by one and one-half inches in extent.

Orbital Traumatism followed by Immediate Monocular Blindness.—Dr. P. A. Callan, of New York, reported two cases. The first was that of a young man, injured while

fencing by the point of a foil, which penetrated his mask and entered the right orbit between the globe and nose. Seen forty minutes after the accident, the eyeball was intact, but displaced downwards and outwards, immobile, with pupil dilated *ad maximum*, and total loss of light perception. Atrophy of the optic nerve came on in the course of three months. The second was that of a young man waylaid and struck over the left eye, and stunned for a moment. On recovering, he found that the vision of his right eye was gone. Seen fifteen hours later, the right eye was blind, with widely dilated pupil, and the movements of the globe impaired. In three days there was right ptosis, and the next day ophthalmoplegia externa. Subsequently optic atrophy occurred. The left eye was not materially injured.

Dr. Saint John had seen absolute blindness and immobility of the eye-ball after an operation for resection of the infra-orbital nerve, attended with rather more than the usual amount of hæmorrhage. The wound was re-opened and the attempt made to break up and wash out the clot. In a few days the normal mobility of the eye returned, but the sight did not, and complete atrophy supervened.

Dr. Myles Standish, of Boston, had seen two medico-legal cases of injury to the head where the patients claimed to be entirely blind immediately after the injury, but the pupils still contracted to light, and there was no ophthalmoscopic evidence of injury to the eye; but the cases, however, subsequently went on to atrophy with dilated pupils.

Dr. Theobald had seen a case in which right hyperphoria and insufficiency of the inferior rectus, had followed resection of the infra-orbital nerve.

Dr. Risley had met with four cases of monocular atrophy of the optic nerve, following blows on the head. In one case the blow had fallen on the supra-orbital ridge, one on the infra-orbital margin, one on the temporal edge of the orbit, and the fourth on the top of the head.

Pulsating Exophthalmos; Ligature of the Carotid.—Dr. R. A. Reeve, of Toronto, reported the case of a man who, shortly after receiving a kick on the side of the head, noticed a high note, and when seen at the end of three weeks had a purring bruit and a pulsating exophthalmos. The eye-

ball seemed to jump forward one millimetre with each pulsation. Compression of the carotid entirely checked it for the time, and intermittent compression was resorted to, being kept up for hours at a time, and continued for three months. But at the end of that time there was no permanent improvement. The common carotid was therefore tied. The operation was done at ten in the morning, and the pulsation and bruit ceased. But by five in the afternoon the purring bruit had returned, though he was able to check it simply by the compression exercised in fixing the jaw. The wound of operation healed satisfactorily, and intermittent pressure had been tried on the other carotid. It promptly checked the bruit, but had effected no permanent result. The patient had therefore been advised to have the other carotid tied also.

Dr. Harlan recalled a case he had seen, in which intermittent compression continued for six months had effected a cure.

Divergent Squint and its Operative Treatment.—Dr. E. Gruening, of New York, read a paper on this subject, calling attention to the fact that the operation of tenotomy as usually described in the books was suited to the internal rectus muscle, but that quite a different operation should be practised on the external rectus, where there was no falling of the caruncle to be guarded against, and everything to be gained by a freer incision. After the tenotomy it was his practice to introduce a suture beneath the ocular conjunctiva of both eyes, and draw its tense across a pad placed on the bridge of the nose, turning the eyes rather strongly in. This suture was allowed to remain for twenty-four hours or longer. In this way it was possible to fully correct two or three millimetres of divergence. For higher degrees he practised resection, removing a piece of the tendon equal in length to the divergence to be corrected.

Heterophoria.—Dr. Swan M. Burnett, of Washington, presented a contribution to the study of this condition, and its relations to asthenopia, headache, and other nervous symptoms. Although less common than ametropia, he believes a disturbance in the muscular equilibrium of the two eyes quite commonly gives rise to these symptoms. In

100 consecutive cases of diminished or painful vision, he found 22 of heterophoria. Of 50 consecutive cases of heterophoria, 28 were of exophoria, 18 of esophoria, 8 of hyperphoria, and one of combined esophoria and hyperphoria. This disturbance of muscular equilibrium can be corrected by prisms or by operation, but the former are in many, if not in most cases, unsatisfactory, partly because of their astigmatic action on pencils of other than parallel rays. Partial tenotomy weakens a muscle, and the weakening can be graduated to a nicety, and the operation should be done when the exophoria or esophoria exceeds 4 prism dioptries (or centrads or degrees of refracting angle), or the hyperphoria exceeds half that amount. The histories were given of four cases of exophoria, and one of esophoria, that had been operated on. Four of these were almost entirely relieved of headaches of the severest type and of long standing, and the eyes are now used with comfort. In the other case the benefit, though less marked, was very great. In performing the operation of partial tenotomy, Dr. Burnett divides all the fibres of the tendon, except a few of the lateral ones, and then excises a triangular piece. In this way he hopes to avoid a return to the primary condition after the healing, which often occurs with the partial tenotomy as ordinarily made.

Dr. Myles Standish, of Boston, had learned by recent inquiry that the relief reported in a series of cases three years ago continued complete.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

Thursday, October 15th, 1891.

HENRY POWER, M.B., President, in the Chair.

Report of the Committee of Reference on Mr. Treacher Collins's Case of Supposed Intraocular New Growth exhibited at the July Meeting.—The growth derives its blood supply from large thin-walled vessels which radiate from the optic

disc. Near the optic disc the nuclei of the cells stain well, and some of the cells exhibit processes and closely resemble those found in ordinary glioma of the brain. Anteriorly this structure is lost, and there are merely indications of degenerated cells, whose nuclei do not stain, arranged radially in reference to the thin-walled vessels. This part of the growth closely resembles an exceptional case of glioma of the spinal cord described by Dr. Sharkey in his Gulstonian lectures. The report is signed by Dr. Sharkey and Messrs. Gunn, Brailey, Silcock, and Collins.

Professor von Helmholtz's Seventieth Birthday.—The President read a letter from Professor H. von Helmholtz, in which he thanked the Society for the address which had been sent to him on the occasion of his seventieth birthday.

Primary Glaucoma in a Patient aged 29.—Mr. Critchett read notes of a case of double subacute glaucoma in a lady of 29. Fifteen days previously she had received a severe shock in the painfully sudden death of a sister. This was followed, within twenty four hours, by severe pain in both eyes, vomiting, loss of vision, and all the other symptoms of subacute glaucoma. The nature of the case was unfortunately not recognised; the vomiting was attributed to hepatic causes and treated accordingly, and when Mr. Critchett saw the patient she was in a painful state of nervous prostration. The eyes were intensely hard, the pupils dilated, the media so hazy that no view of the fundus was obtainable, and there was doubtful perception of light. Although the patient had been practically blind for more than a fortnight, it was decided to perform iridectomy on both eyes. For two hours previously an attempt was made to induce a slight degree of myosis by the use of eserine, but the mydriasis continued as before, each anterior chamber being so narrow that the section was with difficulty made with a narrow Graefe's knife. The wounds healed favourably, but the recovery of sight was very gradual and of course partial. A month after the operation the patient could count fingers, but did not obtain her best vision of $\frac{10}{100}$ and Jaeger 16 till nearly a year later. The fields at that time were limited in every direction, while the discs showed moderate cupping and were partially atrophic. At

the date of the operation, 1875, the Ophthalmological Society was not in existence, or the attention of its members would then have been called to so exceptional a case. The patient was lost sight of till a few months ago, when her sight was found to have remained practically the same as it was in 1876. The noteworthy points in this case were, first, the occurrence of the disease in both eyes in a subacute form at such an early age; secondly, the encouragement it afforded to the operator to attempt the relief of his patient even though he may appear to be heading a forlorn hope; and, lastly, such a case as this should appeal with reproachful but eloquent emphasis to those in authority in the profession who still ventured to include the study of ophthalmology amongst the optional subjects in a medical student's curriculum.

The President spoke of the connection between mental shock and glaucomatous attacks, and referred to cases he had seen of chronic glaucoma in young people.

Mr. Tweedy mentioned a case of a young man, 20 years of age, who had suffered from gradual failure of vision. He was wearing glasses + 2 D. In spite of them there had been an increase of symptoms, with further diminution of vision during the past few years. The patient stated that since the age of 8 he had noticed haloes around lights when tired or excited. There had been increasing mists and fogs daily. The media were clear, the papillæ deeply cupped, and the anterior chambers shallow. Eserine in a solution of 2 grains to the ounce was prescribed, but in the course of a month iridectomy was advised. The patient, however, was anxious to pay a visit to Melbourne on business, and on his return vision had deteriorated. Iridectomy was performed; the wounds healed well. Vision was $\frac{2}{70}$, and Jaeger 1 in right eye, Jaeger 2 in left, and the improvement was permanent.

Mr. Rockliffe (Hull) related a case of glaucoma in a woman, aged 50, in whom the symptoms came on during severe mental shock occasioned by the sudden death of her husband and son.

Pathological Conditions after Concussion of the Eye.—Mr. Treacher Collins gave a lantern demonstration of the

lesions he had found in three eyes lost by concussion. Each was injured by a blow from a blunt object ; in none of them had there been any perforating wound. In two, those fibres of the ligamentum pectinatum which pass to the base of the iris were torn across, and the ciliary muscle was split in its entire circumference, so that the angle of the anterior chamber was prolonged outwards. The split in the ciliary muscle separated its longitudinal from its circular fibres. These latter, together with the iris and lens, had fallen back, thus deepening the anterior chamber. In the third eye there was a more extensive rupture of the fibres of the ligamentum pectinatum. Not only were those which go to the base of the iris torn across, but also those which give origin to the ciliary muscle. The muscle itself, which was but slightly torn, had become separated from the sclerotic. Some of the anterior ciliary arteries were ruptured, giving rise to hæmorrhage into the anterior chamber, which served to hide the lower part of the iris. The upper part had, together with the ciliary body, become so retracted that it was hidden behind the sclero-corneal margin. Hence none of the iris could be seen through the cornea. The lens capsule in all three eyes was ruptured at its equator, and the fibres of the suspensory ligament inserted into it there were torn across, the lens being displaced and the vitreous protruding forwards between its margin and the ciliary body. The free ends of the ruptured capsule were found coiled outwards. Mr. Collins commented on the diminished tension which was observed in each eye, and suggested that possibly it was due to the increased width of the angle of the anterior chamber permitting a more rapid exit of the intraocular fluids than normal.

Exostosis of the Orbit Removed by Operation.—Mr. W. M. Beaumont (Bath) read notes of a case of exostosis of the orbit. The patient, a girl aged 16, suffered great pain from the tumour, which had been gradually increasing in size for about three years. The eye was displaced downwards and outwards, and the vision was much reduced. The disfigurement from the proptosis was very marked. An incision was made parallel with and just below the left eyebrow down to the tumour, which was found to be

attached to the inner wall of the orbit, whence it spread outwards, filling the roof of the orbit. Two hours were occupied in cutting through the base of attachment by means of chisels, as it was thought to be dangerous to apply the mallet or use much force. The patient made a good recovery. The exostosis consisted of an outer hard shell of bone, enclosing a softer cancellous portion. The specimen and photographs of the patient were shown.

The President referred to a case upon which he had operated, and spoke of the difficulty and danger attending operative interference with these cases.

Mr. Silcock mentioned a case he had exhibited to the Society some years since. Opinion had been divided as to the advisability of operation, but the patient, a woman, refused to have anything done. This patient died recently with symptoms pointing to extension of the growth into the brain. Mr. Silcock thought this indicated that an operation would have been inexpedient.

Mr. Tweedy spoke of a case upon which he operated in 1881, the specimen now being in the Moorfields Museum. The growth was very large and of ivory hardness, and much difficulty was experienced in removing it. The patient did very well for a month, and then suddenly had a rigor, followed by coma and death. At the *post-mortem* examination a growth was found in the cranial cavity, much larger than the portion removed from the orbit; there was also an abscess in the frontal lobe of the brain.

Living and Card Specimens.—Mr. S. H. A. Stephenson: Peculiar Retinal Changes.—Mr. Kenneth Campbell: Case of Tremulous Irides and Backward Displacement of Lenses.—Mr. Holmes Spicer: An Unusual form of Lamellar Cataract.

THE PROGNOSIS OF CHOROIDAL SARCOMA.*

BY A. HILL GRIFFITH, M.D.,

SURGEON TO THE MANCHESTER ROYAL EYE HOSPITAL.

The recent occurrence in my private practice of a death shortly after enucleation of an eye containing a sarcoma of the choroid, decided me to undertake an investigation of the after history of such cases.

The case I refer to was that of a gentleman, aged 60, who consulted me early this year on account of his left eye, which I found had not even perception of light, and on examination showed just a trace of injection: the pupil was of moderate size, but bound down to the lens capsule by several adhesions; the iris was somewhat degenerated, reddish-brown in colour, and bulging in places; the cornea, and apparently the lens, were transparent but no reflex whatever could be obtained by the ophthalmoscope; the tension was normal.

I had seen the patient seventeen months before for serous chemosis of the same eye, which got perfectly well in a few days by the use of warm lead lotion and freely snipping the ocular conjunctiva. He attributed the attack to catching cold while bathing in the sea shortly before, and I was, and am still, inclined to think he was perfectly correct in this, for, according to his account, *both* eyes were at first affected—indeed the right worse than the left—and, further, he had a “chalk stone” removed from his eye by a medical man.

The loss of sight had been coming on gradually for about eight months; there had been little or no pain or redness

* Read at the Annual Meeting of the British Medical Association, held at Bournemouth, July, 1891.

of the eye. The other eye was throughout normal in every respect. I ordered him to use atropine, and see me again shortly, hoping that I should then be able to illuminate the eye, and arrive at a diagnosis.

I was called to see him three days later, and found the eye quite hard, strongly injected, and excessively painful; the pupil was only slightly dilated, and, as before, no reflex was obtainable. The atropine was at once stopped, and eserine substituted, a hypodermic injection of morphia was given each night, and iced compresses, and afterwards hot fomentations, were used. In spite, however, of all these measures, the eye remained glaucomatous, and the pain did not in the least abate. The diagnosis, it appeared to me, lay between primary glaucoma, glaucoma secondary to iritis, and intraocular sarcoma. On closely questioning the patient, it was ascertained that the dulness of sight began from *above*, and not from the inner side, as is usual in glaucoma; this, with the fact that the sight was lost long before the inflammatory symptoms appeared, and that there was no remission in the latter, convinced me that I had to deal with a tumour, and, having obtained consent, I removed the eye 21 days from the date of the first visit. After hardening the globe in Müller's fluid, it was frozen, and divided into an upper and a lower half. The sagittal and transverse measurements were each 25 mm., the attached optic nerve measured 9 mm., there was total separation of the retina in the form of a cone, the apex of which traversed a large melanotic growth, which was seen springing by a very broad base from the back of the eye, and projected by a rounded knob-like process in front of the centre of the eye, by far the largest part of the tumour being in the lower half of the globe. No episcleral nodules were present, but there was some distension of the veins behind. The optic nerve sheath was enlarged, but flaccid, and showed some minute dark granules. The growth was shown on examination to be a spindle-celled sarcoma, moderately vascular, but very deeply pigmented.

The pain practically ceased, and the patient returned to his work a week after the operation. Shortly afterwards however, Dr. Douglas Moir, who was called to see him,

found great enlargement of the liver, which had first revealed itself to the patient by the difficulty he experienced in buttoning his trousers. Dr. Dreschfeld, who also saw him in consultation with Dr. Moir, tells me the liver was uniformly enlarged, reached well below the umbilicus, and that no nodules were found. The urine contained melanin. The chief symptom throughout was extreme exhaustion; there was no ascites, and no jaundice. The patient died 62 days after the removal of the eye, and less than a year from the commencement of the affection of the sight. No *post-mortem* examination was obtained.

The case is quite exceptional in the rapidity with which metastasis supervened, but, of course, the liver affection may have been present in a slight degree, even before the enucleation, as the abdomen was not examined. By the kindness of my colleagues, who have allowed me to use their hospital cases, I am enabled to give the after-results of a fair number of enucleations for choroidal sarcoma. I have included only those cases in which the diagnosis has been verified by dissection of the eye, and which have been under observation for at least three years after the enucleation. I may state that in the period of $8\frac{1}{2}$ years here dealt with (January 1st, 1880, to June 30th, 1888) we have seen 40 cases of choroidal sarcoma, 25 males and 15 females, among a total of 119,500 patients giving a percentage of '03, which may be compared with Freudenthal's '04 (24 cases), Hirschberg's '05 (13 cases), and Fuchs' '06 (91 cases from the clinics of ten different ophthalmic surgeons in Germany).

In spite of every effort I have been able to trace only 23 of these cases, and the results are recorded in the annexed table, of which the following is an epitome.

Of these patients 14, which I have arranged first in the list, were alive from three to ten and a half years after operation, and may therefore be termed recoveries; the next 6 in the list died from extension of sarcoma to internal organs, the liver in 4 instances and the stomach in 2. The remaining 3 also died, but

less certainly from sarcoma, the respective causes of death being apoplexy, pneumonia, and congestion of the lungs. In the absence, however, of more definite information, I think it will be well to assume that sarcoma was also the cause of death in these cases. We find then that 14, or 60·85 %, recovered, and that 9, or 39·15 %, died.

This is certainly a larger proportion of cures than I had expected, but it very closely agrees with Martin's 62·83 % in 35 cases, and Knapp's 50 % in 8 cases, though considerably higher than Freudenthal's 37·5 % in 24 cases, Fuchs' 23·53 % in 17 cases, and Hirschberg's 25 % in 8 cases. Von Graefe writing many years ago, said he had never seen a case well more than four years after operation, and Fuchs in 243 collected cases found only 6 % alive after four years. I feel sure some source of error has crept in here ; at any rate, no other observer, estimates the cures at so low a rate. My experience confirms Fuchs' interesting observation that the stage at which the eye is enucleated has little if anything to do with the occurrence of metastasis. For example, case 12, in which the eye was enucleated in the third stage, and when the growth had already been present for 17 years, recovered. while cases 15 and 20, in which the operation was performed at a very early period when the vision was $\frac{6}{38}$ and 16 Jæger respectively, died. I do not feel justified in drawing any deduction as regards prognosis from the histological characters of the growths in my own cases, although I accept as probably true the oft-repeated dictum of the microscopists that the round-celled and highly vascular growths are more malignant than the spindle-celled and less vascular ones.

An examination of the ages of the patients seems to point very decidedly to a better prognosis for the youthful than for those of more advanced years. The average age of the recoveries is 38·3, of the fatal cases 52·1, showing a difference of 13·8, and, what is perhaps

still more striking, the four unusually young patients, aged respectively 17, 20, 20, and 22, are all to be found in the list of recoveries.

In two of the cases, Nos. 16 and 19, which undoubtedly died from metastasis, nodules appeared in the orbit some time before, giving a percentage of 8·26 for "local recurrence," which agrees very closely with statistics of others. Fuchs points out that local recurrence means that some bud of the process has been left in the orbit, while metastasis implies the presence in the circulation of tumour cells; now the former much rarer condition may practically be altogether prevented by early enucleation, while the latter, which constitutes the real source of danger, may start at any period of the primary growth. The two processes are, as Fuchs insists, quite distinct; a patient may die of exhaustion from local recurrence without a trace of metastasis being found on *post-mortem* examination, and of course, as is well known, the converse of this is much more common.

The subject appears to have received very little attention at the hands of English ophthalmic surgeons, and in the text-books, with the exception of Berry's, where it is gone into very thoroughly, I do not find any reference. Physicians, on the other hand, have not been slow to recognise intraocular sarcoma as the source of disseminated disease of a similar nature in other parts of the body. Murchison, in the second edition of his work on Diseases of the Liver, 1877, mentions a case of spindle-celled sarcoma of the liver in a man aged 30, who suffered from pain in the right side for eighteen months, with enlargement of the liver for one month. The left eyeball had been excised by Hulke for malignant tumour nine years before, the sight having been failing for two years. The patient died in twelve months from sarcoma of the liver, which weighed 20lb. 10z. There was no vomiting, ascites, or jaundice. Wickham Legg, *Lancet*, 1883, vol. ii., p. 1,128, read at the Pathological

Society of London the case of a man, aged 57, whose left eyeball had been removed by Streatfield for melanotic sarcoma. Six months before death darkening of the skin took place. This was uniform and not in patches, was most marked on the face and neck, less so on the hands, and not so obvious on the rest of the body. It was a peculiar blue-grey staining. There had been no fits, and the patient had not been having silver nitrate. Spencer Watson, in vol. xxviii. of the Transactions of the same society, mentions a case well three and three-quarter years after enucleation of an eye for sarcoma. Norman Moore, *Lancet*, 1889, vol. i., p. 577, showed at the Pathological Society of London a sarcomatous liver weighing 16lbs., which occurred in a man aged 48, who had been ill four months, and whose right eye had been removed for melanotic sarcoma three years before. At the same meeting Sir William Lawrence mentioned two fatal cases after removal of eyes containing growths. Saundby, *Birm. Medical Journal*, 1891, p. 147, mentions a case of widely spread melanotic sarcoma, with melanuria, in a woman, aged 41, whose left eyeball, shrunken from an old injury received in childhood, contained a melanotic sarcoma which had burst through the sclerotic, and formed a tumour outside, the size of a bantam's egg; the author considered this to have been the starting-point of the affection. Death by metastasis occasionally takes place at a considerably longer period after enucleation than the three years' limit I have adopted, but the following case, recorded by Guttman, *Deut. Med. Woch.*, 1888, No. 52, is by far the most remarkable in this respect. The patient was a woman of 68, who, many years ago, suffered from inflammation and great enlargement of the right eye, accompanied by protrusion, and followed by shrinking and loss of sight. She kept well till five years before her death, when she became invalided from severe asthma and cough, from which she died. At the *post-*

mortem examination there was found sarcoma of the heart, lungs, kidneys, and mucous membrane of the small intestine. The right eyeball and orbit were found to be the site of a melanotic sarcoma, which the writer shows good reason to have been present for 30 years, and to have been the primary lesion.

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No.	YEAR	NAME.	AGE	EYE	HISTORY.	STAGE	CONDITION AT OPERATION.	T	V	OPERATION.	EXAMINATION OF GLOBE.	AFTER HISTORY.
1	1880	Jos. Redding	20	L	Been attending some months for separation of retina.	II	Glaucomatous	+	No.pl.	Enuc.		Well 8½ years after operation
2	1880	Wm. Roberts	52	R	Gradual loss of vision for six months.	I	Episcleral vessels enlarged at nasal side where the tumour can be seen, total separation of retina elsewhere. Cornea and lens clear, pupil round and free from adhesions	+	No.pl.	Enuc.	Melanotic sarcoma.	Well 10½ years after operation.
3	1883	Jas. Booth	55	R		I	Growth easily seen; there is also separation of retina.	N	Fingers	Enuc.		Well 8 years and 3 months after operation.
4	1883	Job. Atkins	31	L	Been attending for separation of retina for fifteen months.	I	Large separation of retina, which has ruptured and enclosed the tumour at nasal side.	N	No.pl.	Enuc.	Melanotic sarcoma, only slightly vascular, and not greatly pigmented, spindle-celled.	Well 7½ years after operation.
5	1883	Thos. Foy	40	L		I				Enuc.	Small melanotic sarcoma, very vascular, but only slightly pigmented	Well 8 years after operation.
6	1885	Alf. Glover	17	L	Vision failing two years, quite blind eighteen months.	II	Retina pushed for-wards nearly up to lens, especially at inner side.	N	No.pl.	Enuc.	Total separation of retina, small melanotic growth size of a pea, besides large, light-coloured vascular tumour, with good deal of stroma.	Well 6 years after operation.

No. YEAR	NAME.	AGE	EYE	HISTORY.	STAGE	CONDITION AT OPERATION.	T	V	OPERATION.	EXAMINATION OF GLOBE.	AFTER HISTORY.
7 1885	Sam Shepley	46	L		III	Ciliary rupture, lens opaque, pupil fixed		No. pl.	Enuc.	Large growth adherent to outside of sclerotic behind, continuous with tumour in the globe.	Well 5½ years after operation.
8 1886	Esther Breakell	20	L	Vision quite lost for three months, dim at times for nine months.	II	Total separation of retina, which is folded against back of clear lens. Shallow anterior chamber	+	No. pl.	Enuc.	Melanotic round sessile tumour size of hazel nut at posterior pole of eye. Spindle-celled, and moderately vascular, pigmentation not uniform.	Well 5 years and 3 months after operation.
9 1886	Mary Gradwell	33	R	Large separation of retina below, T—I, V=19 Jaeger, noted two months before enucleation.	III	Large ciliary staphyloma above, dark mass at lower part of eye, separation of retina.	+	No. pl.	Enuc.	Lower half of eye filled by melanotic growth, not corresponding in any part with the staphyloma.	Alive 4 years after operation.
10 1886	Jane Firth	58	L	Vision bad fourteen weeks	I	Slight fulness of ciliary vessels, corresponding in position with tumour.	—	20 Jaeger	Enuc.	Pigmented sarcoma	Well 4 years and 8 months after operation.
11 1887	May Lever	34	R	Sight failing gradually one year.	I	Injection at nasal side, media clear, tumour easily seen	+	Pl.	Enuc.		Well 3 years and 7 months after operation.
12 1887	Jeremiah Turner	48	L	Was to'd seventeen years ago by Mr. Windsor that there was a tumour at the back of his eye, declined operation	III	Globe shrunken, perforated in front by tumour.		No. pl.	Enuc.	Melanotic growth in front, with spicule of bone.	Well 4 years and 3 months after operation.

No.	YEAR	NAME.	AGE	EYE	HISTORY.	STAGE	CONDITION AT OPERATION.	T	V	OPERATION.	EXAMINATION OF GLOBE.	AFTER HISTORY.
13	1887	Thos. Corbett	60	R	Vision bad twelve months, separation of retina.	II	Glaucoma come on lately.	+	No.pl.	Enuc.	Melanotic sarcoma.	Well 4 years after operation.
14	1888	Shaw Whiteley	22	L	Found out his left eye was blind four months ago.	III		-	Pl.	Enuc.	Sclerotic perforated behind by hard light - coloured growth. Large round, slightly pigmented sarcoma with numerous haemorrhages.	Well 3 years after operation.
15	1882	Sarah Richards	64	R	Came to hospital for spectacles.	I	Eye normal, save for N growth sprouting at outer side close behind lens.	N 35		Enuc.	Pigmented growth at outer side of eye, spindle celled and not very vascular.	Died 3 years and 9 months after operation from "cancer of liver."
16	1885	Alex. Henderson	45	L	Vision failing six months.	II			Shadows	Enuc.	Episcleral nodule near optic nerve.	Local recurrent nodule removed from orbit 3 years after operation; died of "cancer of liver" about 5½ years after enucleation of eye.
17	1885	Mary Unsworth	54	L	Vision gone seven months, eye inflamed one week. Iridectomy done less than a month before enucleation.	II		+	No.pl.	Enuc.	Pigmented round sessile tumour at back of eye.	Died of "sarcoma of liver" more than 3 years after operation.

No. YEAR	NAME.	AGE	EYE	HISTORY.	STAGE	CONDITION AT OPERATION.	T	V	OPERA- TION.	EXAMINATION OF GLOBE.	AFTER HISTORY.
1886	Matilda Upton	57	L	Eye inflamed, and painful one week.	II	Slight injection, media clear, growth seen at outer side extending close up to lens	+		Enuc.		Died of "Tumour of stomach" 1 year and 4 months after operation.
19	1888 Hy. Clabro	48	R		II	Tumour can be seen below, where there is also iridodialysis.	N		Enuc.	Melanotic sarcoma, filling nearly the whole eye, rounded celled, not very vascular	Orbital nodule removed about 1 year after enucleation. Died of "cancer of liver" 2½ years after removal of eye.
20	1887 Lord Townley	32	L	Gradual failure of vision for some weeks. Case reported "Archives of ophthalmology" vol. xvii., No. 2.	I	Central sarcoma, retina not detached	N 16	Jaeger	Enuc.	Spindle-celled sarcoma.	Died of "malignant disease of liver and stomach" 3 years and 8 months after operation.
21	1883 Louise Wrigley	49			I				Enuc.		Died of apoplexy 3 years after operation.
22	1884 Jas Nuttall	55	L	Vision bad twelve months, eye inflamed 3 months.	II	Acute glaucoma, injection of whole globe, no a.c., lens partially opaque, pressed against cornea, no reflex	+	No pl.	Enuc.	Brown round tumour size of raspberry at central region, rounded celled, but poor in vessels and pigment.	Died of "pneumonia" 8 days ill, 6 years and 8 months after operation.
23	1885 - Andrew (male)	65	R	Sight failing ten months.	II		+	No pl.	Enuc.	Large melanotic sarcoma with episceral nodule, very large number of dilated vessels seen with microscope.	Died of "congestion of lungs" about 2 years after operation.

TH. LEBER (Heidelberg). On the Origin of Inflammation, and the Operation of the Agents which cause it. *Leipzig, Engelmann, 1891.*

(Continued from page 332.)

Part IV. deals with experiments concerning the effects produced by the inoculation of various pure substances, *i.e.*, substances free from microbic poison. The object in view was to ascertain to what extent the traumatic inflammation which usually follows the introduction of foreign substances into the living tissues is due to the action of the substance itself, and to what extent to the microbic infection which commonly accompanies it ; and further, by comparing the effects of various chemical substances with each other, and with those of micro-organisms, to obtain fresh light upon the causes of inflammation in general.

During the last ten years many writers have discussed the question whether purulent inflammation is necessarily dependent upon micro-organisms, or whether pure chemical substances also can excite it. No one has denied that many agents other than microbic infection can originate ordinary inflammation, but some experimenters have ascribed to microbes exclusively the power of pus-production ; a close observation of the inflammatory process shows that this position is untenable, for it is impossible to say exactly where suppuration begins. The chief characteristic of suppurative inflammation—*viz.*, the emigration of leucocytes—is present in minor degree in every acute inflammation, although to the naked eye suppuration in the ordinary sense may not be visible. Neither this nor any other feature in the process enables us to draw a line between suppurative and non-suppurative inflammation. The question in debate is therefore illogical ; suppuration is a matter of degree in the inflammatory process, not of essential difference, and this view is confirmed by the fact that the same substance will at one time excite a visible suppuration, at another none, according to the condition of the tissue upon which it acts. Moreover, now that it has been proved that the microbes themselves excite suppuration by means of a chemical product which

can be separated from them without loss of its toxic property, it is unreasonable to contend that the same power cannot exist in other chemical substances. Indeed, it has long been known that certain chemical substances—pure quicksilver, for example—can excite free suppuration. In surgical practice it is true that parasites appear to be the usual exciters of suppuration, and are almost always to be found in purulent fluid, but this does not justify the assertion above referred to; pure chemical agents rarely obtain admission to the tissues, and are therefore little likely to come under observation as causes of suppuration. The question can only be decided by carefully-conducted experiment.

In 1881 Leber showed that the action of microbes in exciting inflammation was comparable with that of certain other irritants, such as croton oil, cantharides, arsenic, and mercuric oxide, and that the action of these latter was not dependent upon contamination with microbic products. Shortly afterwards he showed that mercury introduced either into the vitreous or into the anterior chamber excites a severe suppurative inflammation, which differs from that excited by microbes in having no tendency to spread to other parts of the eye. Numerous experiments by different experimenters, with various substances and by different methods, followed. The results at first were very discrepant, and it became apparent that the effects of the various irritants employed vary with the dose, with the mode and place of introduction, with the rapidity of absorption, and other conditions. For instance, it was found that turpentine excited suppuration in the dog, but not in the rabbit, and the supposition that suppuration necessarily depends upon microbic poison was further disproved by the fact that turpentine is itself a powerful antiseptic.

Leber's experiments were mostly made on the eyes of rabbits. Very strict precautions against the possibility of microbic infection were employed. Among the substances the action of which upon the tissues of the eye was ascertained, the following were the chief:—Gold, silver, glass; iron, copper; mercury, lead; arsenious acid, gum resin, croton oil, turpentine, cantharides, jequirity, indigo, uric acid, oil, starch, and portions of animal tissue. For the details of

these very numerous experiments the reader is referred to the original work. The following is a summary of the results:—

It is definitely proved that pure chemical substances may, like microbic products, excite suppurative inflammation. In the case of microbic infection, the more distant effects, as we have seen, must be attributed to the diffusion of a soluble toxic substance. In the case of the chemical irritants analogous distant action of greater or less intensity, according to the substance employed, is observable. Thus the changes in the cornea, induced by certain of the chemical irritants, closely resemble those already described as occurring in mycotic keratitis, and these same substances excite suppuration in the adjacent tissues, even when direct contact is avoided by introducing them into the anterior chamber in fine glass tubes. There is no difficulty in explaining this effect in the case of those substances which are readily soluble, but it is to be noticed that among the soluble substances there are not many which powerfully excite inflammation, probably because, being soluble, they are rapidly re-absorbed and removed, and consequently exert a comparatively brief influence. On an uninjured mucous surface, where absorption goes on slowly, the effects of such substances are much more intense than in positions where absorption is more rapid.

With regard to certain substances, such as quicksilver, which are usually regarded as insoluble under the conditions which are present in the body, experiment shows that they may excite intense inflammation. Even gold and silver, which in this respect are comparatively inert, are found nevertheless to act as irritants in low degree. The inference is that these substances are not absolutely insoluble in the body, and that even the very minute quantities which dissolve suffice to produce the reactions in question. It is significant that the metals mercury, copper, and lead, which especially exhibit this irritating property, are all poisons in their compound forms; while iron, a normal constituent of the body, though much more readily soluble, is comparatively harmless as a local irritant.

In the case of mercury, a certain degree of solubility is

proved by the fact that after mercurial inunction chemical tests have proved its presence in the blood and secretions. The amount dissolved in the eye is too small to permit of demonstration.

The irritant effect of copper in the eye is not much inferior to that of mercury, although, as poisons, copper compounds are much less active than mercurial compounds. The reason of this, no doubt, is that copper is much more soluble than mercury, and therefore acts in larger quantity on the tissues of the eye. Its presence in the inflammatory exudations and in the tissues and fluids of the eye is readily demonstrable.

The much smaller irritative action observed in the case of lead accords well with the great insolubility of its carbonate. Its solubility in the eye is, however, demonstrable.

In the case of iron it appears that a partial solution is effected by means of the carbonic acid contained in the fluids of the eye, and that after this is more or less widely diffused it is transformed into an insoluble oxy-hydrate, which is deposited in the tissues. Its presence in vitreous and lens is demonstrable by chemical reaction.

The precious metals, gold and silver, produce much less obvious changes. A particle of chemically pure gold may remain in the anterior chamber for years without exciting any change visible to the naked eye. Yet even after the lapse of a few weeks the microscope clearly reveals a proliferation of the endothelium and an emigration of leucocytes. Here, again, there is the strongest reason to suppose that the effect is owing to a partial, though extremely slight, solubility of the metal. Such solubility is proved in the case of silver by the discoloration of the skin, etc., which occurs in those who work in this metal, and who are liable to get particles of it imbedded in the cuticle. In the case of gold, the irritant effect of which is even slighter than that of silver, we may reasonably assume a degree of solubility still more minute.

Oily fluids—turpentine, for example—appear to be to some extent emulsified by the fluids of the eye and thereby diffused. Experiment shows that under very slight pressure

turpentine passes not only into the intercellular spaces of the cornea, but into the epithelium cells themselves.

The precise nature of the chemical process, by which these various substances act upon the living tissues remains at present unknown. The more active substances form a varied group, which have no evident chemical property in common. They are not, as a rule, substances which possess especially active chemical affinities. There is no strong evidence to show that their activity is due to oxidation or reduction, to katalysis, to fermentation, or, as has been supposed, to a power of hindering the coagulation of fibrin. The property which they have in common is that when sufficiently concentrated they kill the living tissues, while in lower concentration they excite active changes in them. They present, however, not merely quantitative, but qualitative, differences in their effects. For example, while mercury induces moderate hyperæmia with free suppuration, croton oil excites a greater hyperæmia with serous exudation, but smaller emigration of leucocytes. Again, the amount of necrosis bears no uniform relation to the amount of reactive change, even when the concentration of the several substances is so proportioned as to equalise their effects as much as possible.

The inflammatory process is the sum of a series of changes—exudation of serous and fibrinous fluids, emigration of leucocytes, phagocytosis, suppurative softening, demarcation, reparative proliferation—which are combined in varying proportions, and have in common the purpose of eliminating or rendering inert the noxious agent. The whole of these changes appear to be direct results of the abnormal irritant. Thus in necrosis with suppuration the latter no less than the former seems to be caused directly by the toxic agent. It has been commonly supposed that the necrosis itself is a sufficient cause for the suppurative demarcation, but this can hardly be the case, for the reactive inflammation which is excited by an infarct is by no means always suppurative. Thus the blocking of a terminal artery by an embolus is commonly followed by suppuration in some situations, but not in others: suppuration is almost constant in the lung, but absent in

the brain, unless the embolus be of septic nature. Such suppuration is most reasonably referred to secondary septic infection, and the liability to it exhibited by different organs appears to depend upon the greater or less ease with which they can be invaded by microbes.

P. S.

(*To be continued.*)

HILL GRIFFITH (Manchester). A Case of Monocular Vertical Hemianopsia. *Medical Chronicle, October, 1891*

The following case, which came under the care of Dr. Mules and Dr. Hill Griffith at the Manchester Eye Hospital, presented a most unusual condition, and one which it is difficult satisfactorily to explain, viz., total and permanent blindness in a large and well-defined portion of the visual field of one eye only without ophthalmoscopic change. The essential features of the case were as follows :—

Sophia A., aged 30, a domestic servant, gave an account of an attack of dimness of the right eye which came on quite suddenly six months previously, when she was endeavouring to catch a glimpse of the body of a man who had committed suicide by drowning, she being at the time in a state of alarm and excitement.

After correction of a rather high astigmatism the right eye was found to have V. $\frac{6}{18}$, the left V. $\frac{6}{12}$. The lower half of the right field, except just below the horizontal meridian at the inner side, was lost. The left field was normal. Repeated careful ophthalmoscopic examination showed no change capable of explaining the defect in the right field. In both eyes there were large crescents surrounding the lower circumference of the discs, which latter were oval; there was also in the lower half of each fundus some exposure of the choroidal vessels, but the discs were perfectly well coloured, and the vessels were of good size and evenly filled throughout, and they pulsated on pressure.

The hemianopic pupillary reflex was well marked, contraction of the pupil taking place only when the beam

of light was directed on to the lower or seeing part of the retina.

The patient, though not very robust in appearance, had always fair general health. Menstruation had been for some years rather scanty, and she suffered from attacks of m'graine. Examination of the chest revealed no pulmonary or cardiac mischief. The patient suffered from ozæna. There was no reason to suspect acquired syphilis.

During three years and four months following the onset of the affection no change whatever took place in the central vision or field of vision, or in the appearance of the discs.

The author refers to a somewhat similar case, published by himself in the *Ophthalmic Review* in 1882 ; but here, as in other published cases, pallor of one half of the disc was present. The special interest of the present case lies in the entire and permanent absence of ophthalmoscopic change. In the author's opinion, the lesion must be located in front of the chiasma, and, judging from the suddenness of the onset, was probably a blocking of vessels either in the retina, in the choroid, or in some of the nutrient twigs which supply the optic nerve behind the eye. He regards the last hypothesis as the most probable, for retinal embolism causes visible changes, and, as regards blocking of choroidal vessels, the symptoms are at present entirely unknown.

It is especially to be noted that the onset of the blindness did not coincide with an attack of migraine, and that the patient had frequent attacks of this latter kind, both before and after the loss of vision.

P. S.

G HARTRIDGE. *The Ophthalmoscope : A Manual for Students.* J. and A. Churchill, 1891.

Perhaps the most apt criticism of this little book is to say that it is unnecessary. We confess we are not much in sympathy with the tendency to multiply small volumes of this sort, which do not pretend to contain anything original, and whose subject-matter has already been adequately discussed in all the text-books, even the smallest.

These considerations apart, however, and judging the book on its own merits, we do not know that there is much to be said against it.

The first chapter is devoted to elementary optics, and is, in fact, a reprint from the author's work on the refraction of the eye; in the second, the essential points of a good ophthalmoscope are described; and the third, which might with advantage perhaps have been somewhat curtailed, deals with the indirect and direct methods of examination, and with retinoscopy. The remaining chapters include a description of the appearances of the normal fundus, and a short account of the more obvious alterations found in disease of the cornea, iris, lens, the vitreous, choroid, optic nerve, and retina. The book is freely illustrated with plates, which—with one or two exceptions only—are very good.

The cream of this little work seems to us to lie in the summary of three pages placed as an appendix at the end of the volume. In it a systematic order of examination is laid down, beginning with the anterior part of the eye and working backwards, and the chief points to which the student's attention should be directed are recapitulated. We cordially endorse the author's final recommendation to the observer to draw what he sees. There is no better method of ensuring accuracy.

A RIEKE (Paderborn). The Form and Development of the Choroidal Pigment Cells. *V. Graefe's Archiv.* XXXVII. i. 62.

The author divides his paper into three parts. In the first he devotes himself to an examination of the various forms under which the choroidal pigment and pigment cells appear in mammalia generally. In the second he determines the time at which choroidal pigment first appears in the human eye, and in the third he gives his conclusion as to probable origin and development of the pigment cells and the pigment itself.

The paper is strictly confined to its subject—the choroidal pigment—and does not touch at all upon the question of the retinal pigment epithelium.

Among mammalian eyes Rieke has examined those of the sheep, ox, calf, pig, ram, guinea-pig, rabbit, and dog; and his conclusions are the following:

1. All the pigment is formed within cells.
2. The form of the cells varies from nearly perfectly circular to very much branched, but the latter are mostly found in the anterior region of the choroidea.
3. The arrangement of the cells generally corresponds to that of the blood-vessels.
4. The masses of free pigment must be regarded as the remains of cells which have broken down, or as cell processes which have become broken off from the cell.
5. The diffused pigment granules are the product of the partial or complete destruction of former pigment cells.
6. In many animals marked pigmentation of the choroidea is present at birth.

In the second part of the paper Rieke cites the various opinions of former authorities upon the period at which choroidal pigment first shows itself in the human eye, and then gives the results of his own examination of the human fœtus, one of the fourth month, two of the seventh, one of the eighth, one of the eighth or ninth, and eight new-born infants. The eyes of children six months old, a year old, and 14 months old were also examined, as well as the eyes of a girl of 16 years. His observations are summed up in the following propositions:—1. The first sign of choroidal pigment is not to be seen till the seventh month of fœtal life. 2. Even at this time choroidal pigment is not to be found in all embryonic eyes: great variability exists in this matter. 3. Pigmented wandering cells are not the source of the choroidal pigment cells, but the fixed connective tissue cells are those that produce the pigment.

The question as to the origin of the pigment itself is not so easily answered. This pigment is the same melanin which is found in the skin, the hair, the pia mater, the nerve cells, etc. It is the same as occurs in various diseases—Addison's, for instance—and in tumours. Its relation to the

blood must be acknowledged, as all cells are directly or indirectly nourished by the blood stream, but the blood pigments do not take part in all physiological pigment formation. Cornil and Ranvier have observed pigment in the embryos of frogs and tritons before the formation of red blood. The sepia, too, forms melanin without possessing any red blood corpuscles, and the pigment of hair contains sulphur, as do also phymatorhusin and hippomelanin, the former found in melanotic skin sarcoma of man, the latter in melanotic sarcoma of horses. Under pathological conditions hæmatogenous pigment has long been known, and its origin demonstrated by the iron reaction of Perls and Quincke, but it has not been observed under normal conditions. It has been merely assumed, from the proximity of the bloodstream to the pigmented cells, that the pigments must have come from the blood either by a specific energy of the cells themselves or in some other fashion. It is, however, universally allowed that retinal and nerve cells generally have the power of forming pigment, but the epithelium of the skin requires the intervention of wandering connective tissue cells, as held by Kölliker, or obtains its pigment from the blood by lymph channels, as suggested by Unna. A specific energy of the cells is generally admitted to account for the choroidal pigment, which is free from iron and sulphur, and is a connective tissue, not an epithelial formation. The question here is whether the pigment is formed in the fixed connective cells or derived from wandering white blood corpuscles. Rieke's observations compel him to assert positively that the pigment is formed by the fixed connective tissue alone, without any assistance from wandering cells. It is not a modified blood pigment, for it never, even during the earliest stage of its existence, exhibits the iron reaction. It is far more probable that the pigment is a substance due to metabolic action of the cells themselves, and it is formed by the cell protoplasm, without any special connection with the nucleus.

J. B. S.

J. HIRSCHBERG (Berlin). Disturbance of Vision from Brain-Tumour. *Neurolog. Centralblatt.*, No. XV., 1891.

Several varieties of visual disturbance due to tumour of the brain are recognised by the author: he arranges and sub-divides them under different headings as follows:—The first variety, characterised by sudden transitory attacks of blindness, occurs more frequently in these cases than is usually believed. Hirschberg has found it a tolerably constant symptom, but thinks that it is often overlooked, owing to the very fleeting nature of the amaurosis. As a rule the attacks occur suddenly, and last for a minute or two or less. They vary much as to frequency, but are generally repeated several times a day. Beyond this recurring temporary blindness there is no affection of sight, both central vision and field being good. Occasionally the blindness is of longer duration, *e.g.*, half an hour, or even hours. The probable cause is a local anæmia due to a passing increase of intracranial pressure, which, in its turn, is in some way connected with the cerebral tumour.

Interference with vision of a more permanent character than the above is to be regarded as directly referable (*a*) to the brain lesion, and (*b*) to changes in the eye itself: hemianopsia of both eyes is the more usual result of the former, while blindness, partial or total, of one or both is induced by the latter. The hemianopsia is not always complete, and in such cases it is often very difficult to map out the field quite accurately, much more so than when well defined. Of course it is possible that by the growth of the cerebral tumour the other half of the field may also, at a later date, be lost, thus causing total blindness; but Hirschberg thinks that loss of sight brought about in this way is rare, death usually supervening before it can take place. In any case the certainty of such an occurrence must be difficult to establish, because the secondary changes in the eye would almost certainly have before then disturbed the remaining vision to such a degree as to completely alter the character of the field. These last remarks must be understood not to apply to growths situated *immediately behind*, or *close in front of*, the chiasma.

Disturbance of vision due to changes in the eye, considered apart from that caused by direct interference with the visual centres, may in brain-tumour cases be classified under three separate heads, viz: (1) Enlargement of the blind spot. This is not noticed by the patient, but may frequently be verified in cases where both central vision and field are normal. (2) Contraction of the visual field. This usually occurs before the central vision has been much impaired; definite, if not very exaggerated shrinking in one meridian may often be recognised as an early symptom, to be followed later, as the disease advances, by a more general and irregular contraction. (3) Loss of central vision. This may happen in one of two ways, thus (*a*): fine changes in the normal retina, small hæmmorrhages, deposits of bright glancing material, even very slight and very localised separation may be noticed gradually to infiltrate the macular region, the extension taking place from the edge of the inflamed optic nerve towards the fovea centralis; (*b*) the nerve fibres going to the centre may be directly or indirectly destroyed by implication of the arterial twigs supplying them. In this case the loss of central vision is usually more serious than when brought about in the manner just mentioned.

As the tumour grows, so do all the visual symptoms become more marked. With the loss of sense of form is joined the loss of sense of colour, while the light sense remains a little longer, only, however, to be followed by total blindness. At the conclusion of the article the writer refers very briefly to treatment, admitting that in most instances little or nothing can be done. There is, however, a class of cases, other than those obviously of a specific nature, which are greatly benefitted by the prolonged administration of mercury. Two cases are reported by Hirschberg to illustrate his paper.

N. M.M.L.

AMERICAN OPHTHALMOLOGICAL SOCIETY.

27th ANNUAL MEETING, HELD AT WASHINGTON,
SEPTEMBER, 1891.

President.—DR. HASKET DERBY, OF BOSTON.

(Continued from page 348.)

Restoration of the Lower Eyelid.—Dr. George C. Harlan, of Philadelphia, had found the sliding flap operation proposed by Dieffenbach most satisfactory. By it, however, a considerable space is left bare, to be filled up by granulation, and the cicatrization of this space in its usual position tends to stretch the flap horizontally and to draw downwards the external canthus. He had resorted to the filling of this space by a flap taken from the skin of the temple. The triangular space thus left can be much diminished by cutting under the edges of the skin surrounding it, and stretching it. Photographs showing the very satisfactory result of this modified operation were shown.

Skin-grafting upon the Eyelid, by Thiersch's Method.—Dr. S. Theobald, of Baltimore, reported two successful cases. They were both treated as out-patients. The grafts were taken in strips half an inch wide from the inside of the forearm. They were kept moist with a warm solution of common salt, no antiseptic being applied to them or to the surface on which they were laid, that surface having been prepared by shaving off the granulations and bathing with the salt solution.

Neuroma of the Lid.—Dr. de Schweinitz reported a case—a lad aged 20—in which the growth was congenital, involving the upper eyelid and adjacent temporal region of the right side. Although clinically the case had presented the appearance somewhat of a fibro-fatty tumour, or of a congenital elephantiasis, a careful microscopic examination revealed, in addition to an overgrowth of the connective tissue of the part, its vessels, sweat glands, and hair follicles, large strands of soft connective tissue, in the centre of which were compressed and atrophied nerve fibres. In all probability the growth had developed from the fibrous-sheath of

small cutaneous nerves, and had later involved the connective tissue of the other structures named. The paper was illustrated by microscopic slides and micro-photographs, prepared from them by Dr. William M. Gray, of the Army Medical Museum.

Vaseline in Gonorrhæal Conjunctivitis.—Dr. F. M. Wilson, of Bridgeport, reported his experience with its use in 47 cases, 19 occurring in newly-born children, and the other 28 in males over 16 years of age with a clear history of infection. The impression derived from this experience was distinctly favourable to the use of vaseline, not as a separate mode of treatment, but as a help to other remedies.

Pressing out of Trachomatous Granulations.—Dr. Knapp gave a demonstration of roller forceps he had devised for this purpose, to act upon the mangle principle. The forceps have two creased cylinders, made to roll upon each other, between which one grips the fold of infiltrated conjunctiva, and then, by withdrawing the instrument, the tissue is freed from infiltration without being lacerated, just as linen is wrung out with a mangle. From the treatment of 58 cases he concluded that follicular trachoma, however dense and extensive the deposition of granulations, can be permanently cured, without scars, at one sitting. In diffuse trachoma the time required for cure can be much abridged. Usually one operation, if thorough, suffices; but cicatrices will be left, as by other modes of treatment; and it may be advisable to let the operation be followed by the use of nitrate of silver solution, or sulphate of copper crystal, for a number of weeks.

Extraction of Foreign Bodies from the Vitreous.—Dr. E. E. Holt, of Portland, reported six cases. In the first a piece of steel was visible just outside the macula; an incision was made in the sclera, between the external and inferior recti, and after repeated trials the steel brought out on the electro-magnet. Recovery was uninterrupted, with vision equal $\frac{1}{2}$. In the second case the bit of steel was visible with the ophthalmoscope on the temporal side of the fundus anterior to the equator. It had entered through the cornea and iris two days before. It was extracted with the magnet through an opening in the sclera immediately over its site.

The eye recovered with vision equal $\frac{7}{10}$. The third case was one in which a bit of steel, afterwards proved to be readily accessible, was carried in the eye for two weeks. Traumatic cataract ensued, the vitreous became fluid, and the eye was lost. In the fourth case the steel had entered the preceding day just outside the cornea in the line of its horizontal diameter. Not being visible, it was supposed to lie near the wound of entrance, which was enlarged and the steel extracted with the magnet. Recovery with good vision followed. In the fifth case a large piece of steel was removed from the wound, which extended across the cornea and involved the lens. The latter was extracted, and the eye healed well with some vision. In the sixth case a piece of a metal cap entered through the sclera, causing loss of vitreous and collapse of the globe. It could not be seen, but, after considerable search, was grasped with the forceps and extracted. The eye recovered with perfect outward appearance and some sight.

Extraction of Foreign Bodies from the Interior of the Eyeball.—Dr. S. B. St. John, of Hartford, reported three cases. In the first the foreign body was lodged in the iris, and the magnet failing to dislodge it, he drew out that portion of the iris, disentangled the foreign body, and returned the iris to the eye, which made a good recovery. In the second case a long piece of fine wire from a whip lash remained in the eye for a month, transfixing the iris and lens, and giving rise to a little pain and irritability of the eye. It was extracted, and the eye did well, the lens undergoing absorption. In the third case a needle-like fragment of steel entered the inner side of the globe 2 mm. from the cornea, and was found with the ophthalmoscope hanging in the retina near the macula. It was left undisturbed to become encysted.

Calibre of the Retinal Vessels after Recent Head Injuries.—Dr. Albert G. Heyl, of Philadelphia, reported the results of observations made in twelve cases of recent injuries to the vault of the cranium. The series included two groups. In the first the phenomena of traumatic delirium or its initial stage existed; the retinal veins were found little altered in width, but rounded and fuller, while the

arteries were contracted. In a typical case of this group, one of pure brain contusion, this condition of the retinal vessels was preceded by one of dilatation of both arteries and veins. The second group included those cases in which the symptom called *sopor alternans* was present, a condition in which, after a severe head injury, the patient at short intervals passes from a condition resembling sleep to one of waking, and then back again to sleep. In this condition the pupils vary in diameter with these intervals, and in one case the retinal vessels were observed to do the same.

Amaurosis and Optic Atrophy.—Dr. T. Y. Sutphen, of Newark, reported three cases. In the first complete blindness came on after suppression of menstruation from a long walk in the snow, and later atrophy of the nerve occurred. In the second case the blindness followed parturition, and was also succeeded by atrophy. In the third case there was complete loss of sight without any ophthalmoscopic change, and this had been followed by partial recovery.

Additional Experiments to determine the Lesion in Quinine Blindness.—Dr. de Schweinitz referred to the results of his previous experiments published in the *Ophthalmic Review* (page 49 of the present volume), and stated that by a second series of experiments it was shown that the results there reported can be produced by all of the various salts of quinine, and that prolongation of the quinine blindness results in a true optic atrophy sometimes associated with the production of thrombosis or embolism in the central retinal vessels. In sections made from a dog, kept completely blind for two months, the microscope showed cupping of the optic nerve entrance, complete atrophy of the optic nerve, chiasm and tracts, an organised thrombus in the central vessels, and some degeneration of the lenticular ganglion. A very remarkable fact is the selection of the optic nerve for the influence of quinine, as careful sections of the ciliary and other cranial nerves showed absolutely normal structure. The change in the pericellular lymph spaces, which had been found in the first research, was shown to be unconnected with any action of quinine, being purely an accidental occurrence, perhaps

due to some fault in the technique. The conclusions from these experiments are : That the action of poisonous doses of quinine is undoubtedly originally due to a constriction of the peripheral vessels. That later, distinct changes, either in the blood itself or in the blood-vessels, are originated, and that consequent thrombosis may occur, followed by complete atrophy and fatty degeneration of a large portion of the visual tract. These conclusions are in accord with those of Barabasheff based on observation of the clinical symptoms produced by very large doses of quinine in human adults. The paper was profusely illustrated by photo-micrographs and microscopic sections made by Dr. William M. Gray.

Ocular Symptoms found in the so-called Mongolian Type of Idiocy.—Dr. C. A. Oliver, of Philadelphia, from a clinical study of this subject, reported the following conclusions :—The conditions which have mainly contributed to the naming of the type, the malpositions, irregularity of contour, and inequality in comparative size of the bony orbits, with the obliquity of the attached ligamental and tarsal tissues, giving the palpebral fissures their peculiarity of direction, the lids their shortness, and the eyes their apparently faulty situation, are merely the rough ocular expressions of the osseous and ligamentous malformations characteristic of the disorder. The eyeball, in nearly every instance, presents the results of low and chronic forms of neuro-retinitis and choroiditis ; or the substance of the intraocular ending of the optic nerve, and the circumjacent retinal and choroidal membranes, share in the soft, jelly-like œdema so universally recognised in the external portions of the organ. The mucous membrane of the eye, and its appendages, exhibit the pathological peculiarities seen in the chronic and constantly-recurring provoked inflammations of other mucous surfaces, which, in the great majority of instances, lead to death. The changes in the vessels of the retina, where the walls appear thin and peculiarly tinted, and the sequelæ of hæmorrhagic extravasations into the retinal substance, are common ; while the general clinical features of imperfect circulation show the prominent characteristic lesions, and, probably, the ætiological condition, of

the disorder — imperfect development, with consequent disease of the entire vascular system.

Eye-strain from the Wearing of Cylindrical Correcting Lenses was the subject of a paper by Dr. Jackson to be published elsewhere in this journal.

Insanity following the Use of a Mydriatic.—Dr. Taylor reported a case in which a four grain solution of atropine sulphate was used three times a day in both eyes to produce paralysis of the accommodation. It had been used for two days without causing any especial symptoms or unusual nervousness. On the third day, while waiting to have her refraction tested, the patient became excited and gave way to causeless and uncontrollable weeping. She was removed to her home and became more rational, but again lost control, and grew worse until she went into a confirmed melancholia. Prior to this she had been under prolonged strain in caring for her family and nursing an insane mother, who shortly before had been removed to an asylum. Had the mydriatic any influence in precipitating the attack?

Note on Hyoscyamine.—Dr. S.D. Risley, of Philadelphia, reaffirmed the high estimate of the value of this drug, as a mydriatic in the diagnosis and treatment of ametropia, and choroido-retinal conditions resulting from it. That its value was not more generally recognised was probably due to the variable and inferior preparations that were so largely sold under this name. It is a drug that is certain to be altered by excessive heat or strong alkalies often resorted to in its preparation, and on this account only the finest crystalline specimens of the drug prepared by the most careful manufacturers can be relied on.

Dislocated Lens.—Dr. Theobald described the further history of a case in which, as he had previously reported to the society, useful vision had been maintained by the aid of a totally dislocated lens. After six years there came lines of opacity and the lens was no longer useful. The patient was now 22 years old. The capsule was ruptured, and the lens substance escaped into the vitreous, which became clouded. There was increased tension of the globe, and vision reduced to 1-200th. Under the local use of pilocarpine and the internal administration of mercury, the

vitreous cleared and the tension returned to normal, and he now had good vision with a weak glass, the eye having previously been highly myopic. The other eye had remained unchanged.

Asthenopia from Sub-normal Accommodative Power in Young Persons.—Dr. Theobald questioned if, since the work of Donders had made us familiar with the frequency of errors of refraction, the pendulum had not swung too far in the tendency to ascribe to ametropia all cases of asthenopia, such as had formerly been regarded as due to "weakness" of the eye. He believed that, apart from presbyopia and the effects of acute disease, weakness of the ciliary muscle is a common cause of asthenopia. In some of these cases the near point seemed to be as close to the eye as it should be at the patient's age, yet there was inability to do near work.

In these cases an important symptom was a tendency to excess of convergence at the near or working point, as compared with the muscular balance for distant vision, a weak ciliary muscle working better with the support of strong convergence. Cases of this kind were relieved by the use of convex lenses for near work, with the additional aid of having the lenses decentred outward to allow the stronger convergence where this was necessary.

The Blind of New York City.—Dr. H. S. Oppenheimer of New York, presented a statistical paper, based on 571 cases examined by him to determine their claims to municipal assistance.

Colloid Tumour of the Optic Nerve.—Dr. John Green, of St. Louis, reported a case and showed coloured sketches of the appearances of the fundus. Both eyes were affected, the right being the worse. The patient gave a history of some night-blindness, but as a boy he was a good shot. Within five years for the right, and three years for the left, vision had failed so that he could only see fingers in the temporal fields. Under a four weeks' course of mercurials, vision improved in the left eye to 1-24th, and later to 1-19th.

Glaucoma after Extraction of Cataract.—Dr. F. Buller, of Montreal, reported three cases in which glaucoma had occurred after the extraction of senile cataracts, done with

iridectomy. The glaucoma supervened a considerable time after the extraction, in one case after four years. In another case that had 20-50ths vision, a thick capsule was divided, and the glaucoma followed. In but one was there incarceration of the iris ; two of the eyes were lost. In the third the glaucoma seemed to have been permanently checked by the use of eserine.

The Society chose for *President* Dr. Hasket Derby, of Boston ; *Vice-president*, Dr. Geo. C. Harlan, of Philadelphia ; *Secretary and Treasurer*, Dr. S. B. St. John, of Hartford ; and *Corresponding Secretary*, Dr. J. S. Prout, of Brooklyn ; and decided to hold the next annual meeting at New London, the third Wednesday in July, 1892.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

Thursday, November 12th, 1891.

HENRY POWER, F.R.C.S., President, in the Chair.

Traumatic Abscess of the Region of the Left Angular Gyrus, with Right Hemianopsia (Limited Fields) and Word Blindness, treated by operation.—Dr. Beevor and Mr. Horsley reported the case of a lad, aged 12, whose head was injured by a horse's hoof about Christmas, 1890. He suffered from headache for three weeks after the accident, when he became suddenly sick and unconscious, and had a general fit ; three weeks later his sight began to fail. When admitted to the National Hospital for Paralysed and Epileptic, on March 9th, 1891, he had double optic neuritis, right hemianopsia, and sub-normal temperature. There was an adherent tender scar about 3 in. long on the left side of the head. A diagnosis of abscess, probably in the left angular gyrus, having been made, Mr. Horsley proceeded to operate, and found a fracture of the bone, with some necrosis, corresponding to the adherent scar. On trephining behind this an abscess was discovered in the upper part of the angular gyrus and the

outer surface of the occipital lobe, and 3ij of pus let out. After the operation the boy was found to have word-blindness, and, on taking the fields, the right was found to be contracted on the nasal side to 20° , and on the temporal side to 5° , while in the left eye the nasal was reduced to 10° , and the temporal to 50° . The case progressed fairly well, but hernia cerebri subsequently developed, and on May 19th the patient died. At the necropsy the dura mater was adherent on the left side to the margin of the Sylvian fissure as far forward as the ascending parietal convolution, to the lower third of the supramarginal gyrus, posterior part of the superior and middle temporo-sphenoidal convolutions, the whole angular gyrus, except the upper fourth, and over the anterior part of the outer surface of the occipital lobe. On a horizontal section there was much softening, extending inwards across the hemisphere from the hernia cerebri.

Temporary Blindness in a Child following Fracture in the Occipital Region.—Mr. Page related this case. The patient, who was only 3 years old, and in whom ophthalmoscopic examination was extremely difficult, had remained unconscious for several days after a severe fall on the head. There was a large hæmatoma, but no sign of depressed fracture in the left occipital region. Slight weakness in the right arm, nystagmus and right internal squint ensued, but the important feature in the case was the complete loss of sight, which, in the opinion of all who saw her, was undoubtedly present. Several months elapsed before there was any improvement in this respect; and even now, sixteen months after the accident, it was by no means certain that vision had been fully restored. The site of the chief injury to the head, and the fact that a linear irregularity could now be felt at the posterior superior angle of the left parietal bone, made it probable that there was originally a fracture in the occipital bone extending from this place downwards to the base; and it is surmised that severe bruising of the convolutions in that region might have accounted for the blindness. The opportunity of trephining, however, did not arise; and, although this view of the case was founded more on conjecture than on established fact, there was certainly, as far

as could be made out, no other cause for the loss of sight ; the optic discs were invariably normal, and there was no indication of injury in the anterior parts of the cranium, orbits, or brain.

Mr. Nettleship described briefly the case of a sailor lad, aged 19, who while at sea had received a severe blow from an iron chain on the left side and back of the head and across the bridge of the nose. He stated that he could not see with his right eye. On examination he was found to have right homonymous hemianopsia, and apparently had hallucinations of sight, the objects seen being referred to the blind half of the fields. The line of demarcation in the fields deviated, as it so frequently does, about 10° towards the blind side close to the fixation point. The left half of each field was full. A deeply-depressed scar could be felt to the left of the median line, a little above the superior curved line of the occipital bone. There were no definite changes in the optic discs.

The President, in discussing these three communications together, referred to the uncertainty which still existed as to whether the angular gyrus or the occipital lobe should be considered as the centre for visual perceptions. The cases now reported did not seem to help materially in the elucidation of this question, as in the only one in which *post-mortem* examination was made the lesion affected both areas.

Dr. Mackay (Edinburgh) referred to the question of crossed amblyopia, and expressed his opinion that the cases hitherto published under this title by no means proved the occurrence of such a condition. He thought that the line of demarcation in cases of hemianopsia would be found to pass through the fixation point more frequently, if the tests employed were more delicate.

Mr. Priestley Smith endorsed the remarks of the last speaker. These cases raised several important questions. First whether the angular gyrus is really a visual centre. Hardly any cases, he thought, had been recorded which were free from the suspicion that the visual disturbance was due not to the lesion of the gyrus itself, but to implication of visual fibres lying beneath it at a deeper level. Secondly,

whether a lesion lying farther back than the optic commissure does under any circumstances produce the alleged crossed amblyopia, *i.e.*, defect in the visual field of the opposite eye only. His own impression so far was that it did not. The visual defect in Dr. Beevor's case was of the hemianopic type. Certainly they met with persons who for a time had much impairment of vision in one eye in association with functional disturbances in the brain, and some pathologists had accepted such cases as a proof that a brain lesion could damage the vision of one eye without affecting that of the other. Hypothetical schemes had been invented to explain this, but so far, he maintained, there was no anatomical evidence in its favour. On the contrary, the anatomical evidence, so far as it went, seemed to show that every lesion of the visual structures behind the commissure must produce defects of the hemianopic type. A more reasonable hypothesis, he thought, was the one which attributed the concentric contractions of the field met with in neurasthenic and hysterical amblyopia to disturbances in the nutrition of the retina itself, perhaps through invisible changes in the capillary circulation of the retina, perhaps in that of the choroid. In the third volume of the *Ophthalmic Review* he had fully discussed this question, and need not repeat the arguments here, but he would like to draw attention again to a point of practical value, namely, the use of a pale blue glass as a means of confirming the diagnosis in cases of this kind ; such a glass gives, in some cases, not in all, an immediate increase of the acuteness of vision and an extension of the field. A third question was whether in cases of hemianopia the line of demarcation passes exactly through the macula lutea or whether it makes a curve round it. That was often a difficult matter to determine, for the slightest fault of fixation on the part of the patient would lead to an erroneous conclusion. It had occurred to him that there was a method which might settle the question definitely in the case of a sufficiently good observer. It was the old experiment of looking through a pin hole in a diaphragm held close before the eye and

slightly shaking it so as to bring into view the capillary circulation of the retina ; or it might be done by the method described by Dr. Maher, of Sydney, viz., by holding a strong convex lens at its own focal distance in front of the eye and looking at a distant point of light while slightly shaking the lens. In this way a beautiful image of the capillaries around the macula, and of the macular region itself, was obtained, and a good observer suffering from hemianopia would, the speaker thought, be able to determine the exact position of the line of demarcation in relation to the macula. This plan might, perhaps, supply a means of investigating, not only hemianopic, but other, defects in the region of the macula.

Mr. Nettleship said they were indebted to Mr. Priestley Smith for his theory of the retinal (peripheral) origin of certain cases of amblyopia. He thought it difficult to explain how an eye could remain so defective, as many of these cases of functional amblyopia did, for a very long time without any visible changes in the retina or its vessels. In quinine amblyopia there was restriction of the field of vision, not unlike that noticed in the cases under discussion, but the arteries in the toxic affection were always narrowed, and often remained so for the rest of the patient's life. Again, in functional blindness the pupils remained active, and he was at a loss to understand how this could be accounted for if the defect were due to retinal changes, assuming the loss of sight to be sufficient to entail sluggishness of the pupils under ordinary circumstances.

In reply to Mr. Nettleship, Mr. Priestley Smith observed that in the kind of amblyopia in question the defect was always greatest at the periphery, least at the centre of the retina, and this might account for the fact that the action of the pupil, which depended chiefly on the macular fibres, was not lost. Moreover, the absence of visible change in the fundus was not irreconcilable with his hypothesis. Dr. Hill Griffith had lately published in the *Medical Chronicle* a case in which the lower half of the field of one eye only was absolutely lost. Here the lesion must, he thought, be in front of the commissure, and yet during more than three

years the appearances in the fundus had remained quite normal.*

Mr. Johnson Taylor mentioned the case of a man, aged 60, who was attacked suddenly by right homonymous hemianopsia, word blindness, and aphasia.

Mr. Horsley and Dr. Beevor, in replying, said they did not wish to class their case as one of crossed amblyopia, and did not consider that it threw much light upon the cortical localisation of vision. It seemed most probable that the cuneus was the true centre, at least for direct vision. Referring to Mr. Page's case, in which it had been found impossible to obtain perimetric measurements of the fields of vision, Mr. Horsley spoke of a method of examining the field which had been used for monkeys and other animals, and thought it might prove of service in the case of very young children.

Living and Card Specimens.—Mr. Kenneth Campbell : Case of supposed Rupture of the Choroid. — Mr. Johnson Taylor : Eyeball containing Two Distinct Sarcomatous Tumours.—Mr. Sydney Stephenson : Unusual Retinal Reflex.—Mr. Wainwright : 1. Intraocular Growth, 2. Growth on Eyelid. 3. Displacement of Iris after Injury. —Mr. Lawford : Unusual Defect of Ocular Muscles.

* For an abstract of this case, see p. 369.



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